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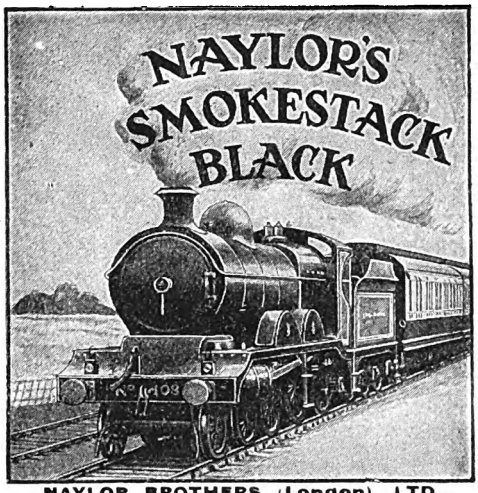

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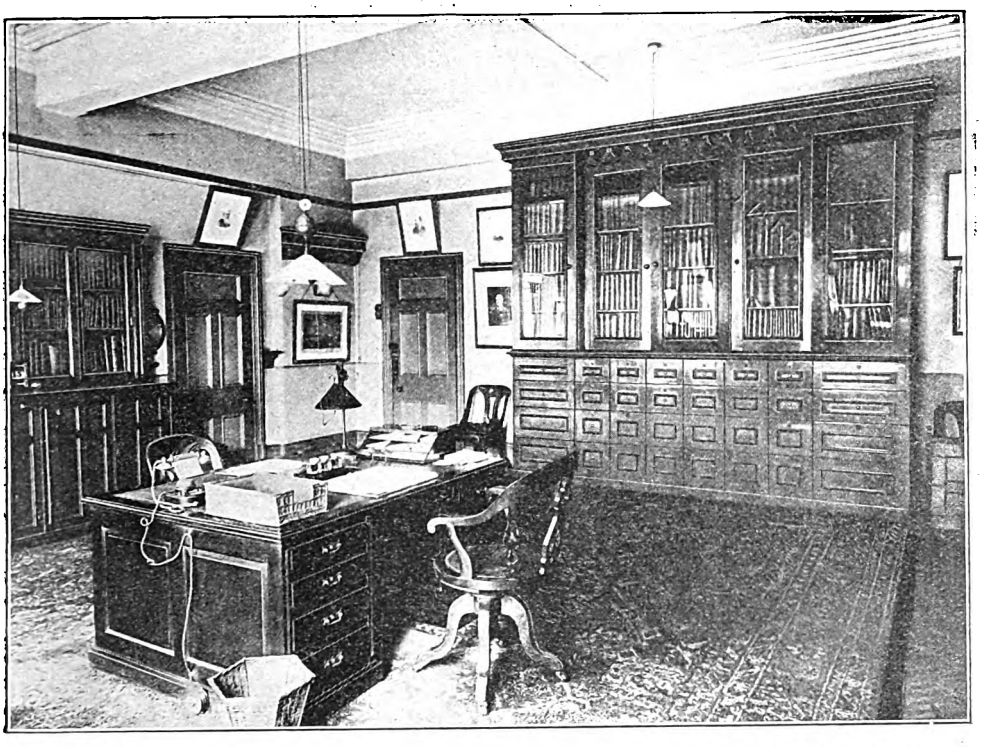

Photo] [*Topical Press Agency.*

MR. O. S. HOLT'S PRIVATE ROOM.

The Secretary's Department of a Great Railway.

By J. F. GAIRNS.

THIS department introduces a section of the business of a railway company which is different in every way from such departments as have already received attention in articles of this character published in these pages during recent months; and one concerning which the ordinary public is considerably less informed than it is in reference to the better known executive and operative chief officers and their staffs. Yet the Secretary is probably the oldest-established of all chief officers; and although his work is now clearly defined and distinguished from that of other departments, he still takes precedence in that he is in closest touch with the Board of Directors, and through him are conveyed the decisions of the Directors to every officer, whatever may be their own relations and standing with the members of the Board. The Secretary is, in fact, the "staff" of the railway company, as distinct from the staff who manage, maintain and operate the railway which constitutes the business of the company.

He is the one official representative of the Company, and for all legal purposes its accredited executive officer. Licences are held by him, and in actions at law the Company sue or are sued in his name. While he exercises no control over the outdoor executive management of the railway, his duties are of so highly technical a nature that an otherwise well-trained and competent traffic official would find himself hopelessly at sea in this position. His clerical staff are generally men who have grown up from boyhood in association with the manifold complexities of the office. He is, as his title implies, essentially the custodian of the secrets of the Company, and, moreover, the official mouthpiece of the Chairman and

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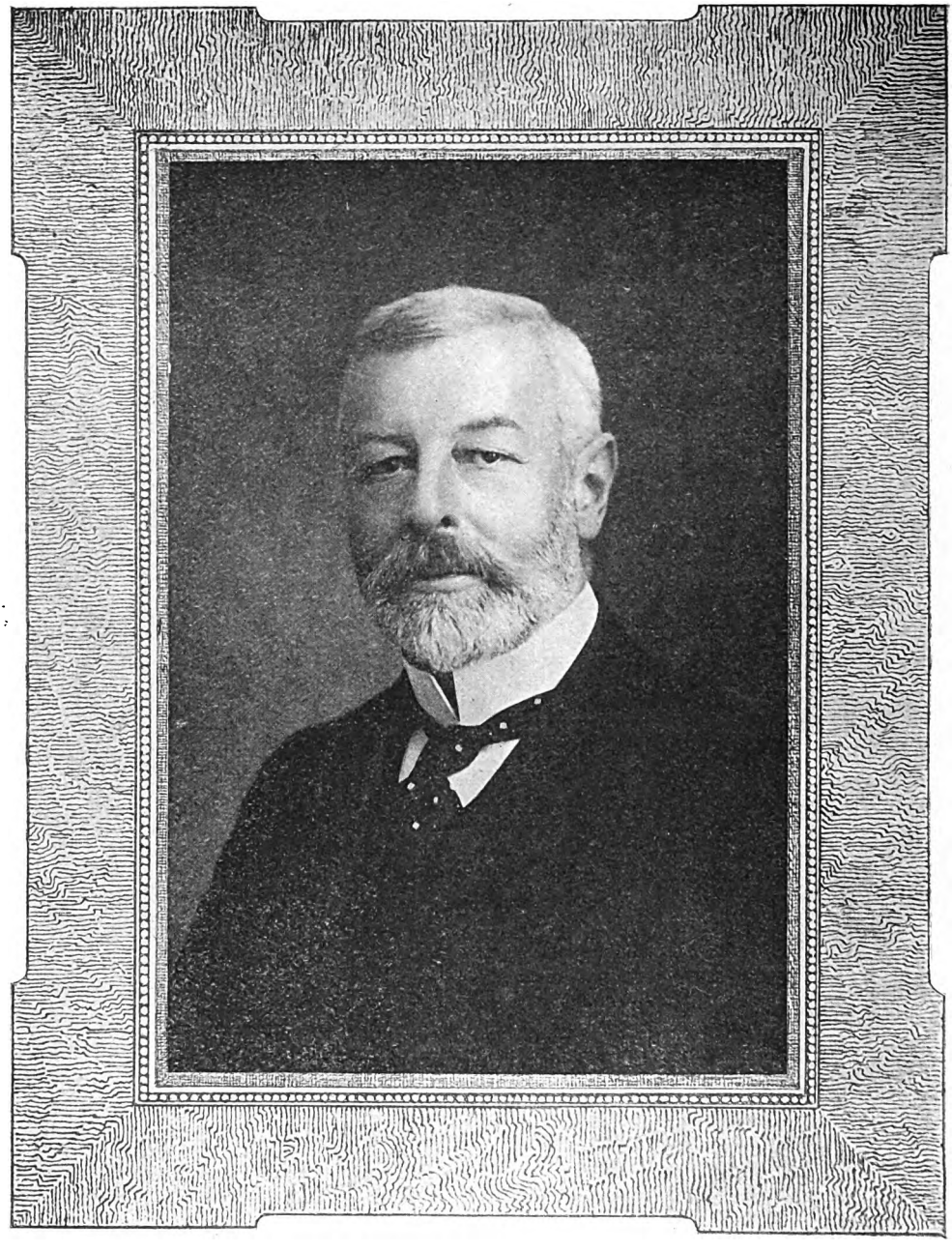

Photo] [*Elliott & Fry.*

MR. OLIVER S. HOLT,
Secretary and Registrar: Great Central Railway Company.

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of the railway, combining the offices of General Manager, Traffic Manager, Goods Manager, Accountant, etc. The first stage in introducing departmental responsibility would be to give the Engineer and Locomotive, Carriage and Wagon Superintendent a degree of independence, in view of the special technical attributes required for new positions; but it was only as railway systems came to be relatively big concerns that the Secretary became divested of his managerial functions, in favour of departmental chiefs, with a General Manager—originally styled "Chief Traffic Manager"— as the co-ordinating factor between all of them, and as the medium through which the authority and administration of the Board of Directors is transmitted to the working staff for realisation.

There are still several instances, some on fairly extensive railways, where the offices of Secretary and General Manager are combined; and on small lines the Secretary holds very much what was his original position generally. But in the case of all the large railways, as well as a number of others of medium size, the magnitude of the company's operations has necessitated the limitation of the Secretary's functions to "company" affairs, the General Manager and other officers being mainly concerned with the working and administration of the railway itself.

Therefore, it is substantially correct to describe the Secretary as the direct representative of the Board of Directors, responsible for recording its proceedings, transmitting instructions therefrom, and dealing with financial aspects of the Company's business, while in some cases the Company's accounts (even where an independent chief accountant deals with receipts and expenditure in working the railway) are in his charge, and he also acts as registrar and head of the share and transfer department. The Secretary is also, as a rule, secretary—personally or through his assistants—of committees dealing with particular phases of the company's operations, such as subsidiary organisations formed for various purposes, and joint line committees. In the latter case, of course, the railways concerned generally share the secretarial appointments involved. There are also insurances, compensation, pension funds, provident societies, conciliation boards and other matters which are usually or frequently dealt with by the Secretary's Department, according to the organisation in force. An important part of the equipment is a thorough knowledge of all special Acts regulating the issue of capital, the preparation of Returns, Notices of General and Special Meetings, etc.

MR. J. A. CAMPBELL.

The Accountant and Cashier are somewhat variously allocated. In a sense they are both operative officers, in that their principal duties are associated the one with the accounting and the other with revenue and expenditure incidental to the traffic of the railway and its own expenses of working. But as both these offices lead naturally to the secretary it is usual to

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associate them with his department, even when the respective holders of these positions are independently responsible as far as their departments can be considered apart.

In dealing further with the work of this important department it will be convenient to consider the organisation and personnel of a particular example; and in this connection the courteous co-operation of Mr. Oliver S. Holt, Secretary of the Great Central Railway Company may be acknowledged, whereby the writer is enabled to amplify this article as desired.

The selection of the secretarial department of the Great Central Railway Company is further appropriate in that Mr. Holt has the distinction of being the *doyen* among railway secretaries, while no company has had so remarkable a secretarial history as has the Great Central, seeing that although the Manchester, Sheffield and Lincolnshire Railway Company dates back to 1850, when further amalgamations converted the Manchester, Sheffield and Lincolnshire Railway, formed in 1847, into what was substantially the same concern as that which became the Great Central Railway in 1897, it has only had two secretaries during the whole of the period of 65 years that have since elapsed. Mr. Edward Ross held that appointment from 1850 until 1892, an almost unprecedentedly lengthy term of such an office, and Mr. Holt has been secretary ever since, his holding of that position covering the "great transformation" which converted the cross-country and relatively secondary Manchester, Sheffield and Lincolnshire Railway into one of the "great" trunk line systems of the country under the title of the Great Central Railway.

MR. J. W. LAWTON.

Like many other prominent railway officers Mr. Holt had his early railway training on the Lancashire and Yorkshire Railway, but soon transferred his services to the Manchester, Sheffield and Lincolnshire Company, holding positions first in the Goods Manager's and then in the General Manager's Departments. For some years immediately prior to his appointment as Secretary in 1892 he was chief clerk to the then General Manager, the late Sir William Pollitt, at that time, however, Mr. Pollitt. It will, therefore, be seen that Mr. Holt had opportunities for acquiring considerable experience in general railway work, and this no doubt stood him in good stead in view of the notable developments in the scope and scale of its operations which the evolution of the Manchester, Sheffield and Lincolnshire Railway of the 'nineties into the Great Central Railway of the twentieth century has occasioned.

Until 1905, the head offices of the Great Central Railway remained in Manchester, but from that date Mr. Holt and his direct staff have been located at Marylebone, though as will be seen, certain of his principal assistants are still stationed in Manchester as being more convenient for the northern and busier division.

During nearly the whole of his term of office Mr. Holt has had no assistant bearing a

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definite title as such, but for many years his "Chief Clerk," Mr. W. H. Edge, has been virtually his assistant, and has borne all the responsibilities of such an appointment. In fact, the whole of the sub-departments of the secretarial offices are correlated under Mr. Edge, and he is responsible for the general organisation and departmental management thereof.

Recently, however, the rank of Assistant Secretary has been created. For the time being this position is one of a peculiar character, and does not impinge upon Mr. Edge's sphere of work. Rather the holder of this new position, Mr. J. A. Campbell, may be described as a personal assistant to the Secretary for the general benefit of the department, and in view of the fact that both Mr. Holt and Mr. Edge have almost completed their periods of active service, after having worked so many years under three notable railway chairmen, namely, Sir Edward Watkin, the Earl of Wharncliffe, and Sir Alexander Henderson, the present Chairman of the Company, so that important changes may follow their retirement into well-deserved leisure. That is, however, a matter peculiar to this particular example; but it may be considered that as a general principle the large scale upon which most of the leading railway companies now operate calls for a Secretary and an Assistant Secretary, the latter taking most of the subsidiary responsibility of his chief, as well as assisting him in reference to his principal responsibilities.

On the strictly secretarial side Mr. Holt's staff includes four principal sub-departments: (1) General and Boards and Committees; (2) Stock and Share Registration; (3) Compensations, Insurances, etc.; and (4) Joint Lines (Secretarial and Accounting).

Photo] MR. W. H. EDGE'S OFFICE. [*Topical Press Agency.*

The first of these constitutes the Secretary's department proper, seeing that it involves the Secretary's close relation to the Board of Directors, and the management of the railway company's operation by the Board. Here Mr. Holt is personally concerned, attending all Board Meetings, including those of the various Board Committees, except in so far as Mr. Edge and Mr. Campbell may assist him. The work involved includes the recording of all proceedings of the Board and Committees, responsibility for

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MR. R. F. ARDEN.

transmitting instructions therefrom, convening meetings and preparation of agenda, drafting reports to the proprietors, filing and entering agreement and other documents, issue of invitations for tendering for works and supplies, acceptances of tenders, scheduling of documents of all kinds, correspondence, and the multifarious duties incidental to the general work of the department. This section, which may be described as the general staff, is controlled directly by Messrs. Holt, Edge and Campbell; but includes a staff of assistants, the seniors being men of considerable experience, each responsible for particular duties.

In the case of the Stock and Share Registration Department Mr. Holt is chief in the capacity of Registrar, with a chief transfer clerk in the person of Mr. R. F. Arden. There are 17 other clerks, each with well-defined duties, and between them responsible for dealing with all stock and share operations, issue of new capital stock when made, the business associated with shareholders' meetings, distribution of dividend and interest warrants, entering transfers of stocks and shares, etc.

The third sub-department is concerned with all passenger compensation claims and general insurances affecting the company as a whole, the management of the Watkin Meritorious Conduct and Edward Ross Memorial Fund, and analogous matters. This again is under the direct oversight of Mr. Holt, the Secretary, and his assistants, Mr. Edge and Mr. Campbell, and managed by Mr. Charles Eaton, and the same applies to the joint lines section, where Workmen's Compensation is also dealt with. Most large railways are parties to a number of joint lines and committees, and the Great Central Railway has considerably more than some other systems. Each railway concerned in a joint committee has, of course, its responsibilities, but the secretarial and other appointments are divided between the parties affected.

MR. CHARLES EATON.

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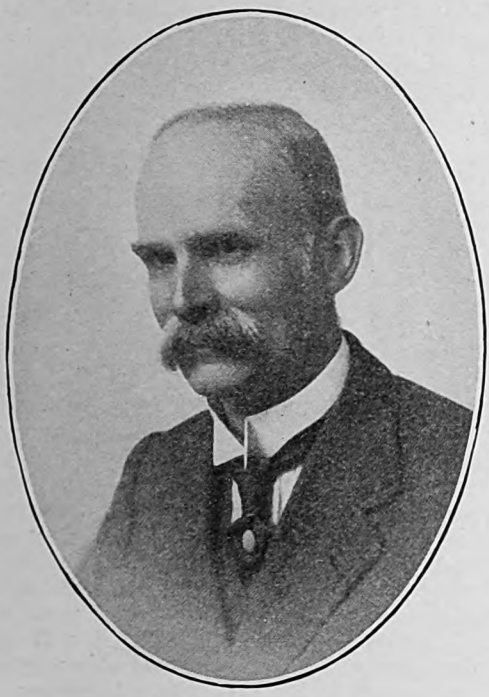


MR. WILLIAM SLADE.

In this way Mr. Holt holds the following appointments :

Great Central and Midland Joint Committee, Secretary and Accountant.

Great Central, Hull and Barnsley and Midland Joint Committee, Secretary and Accountant.

Great Central and North Staffordshire Joint Committee, Secretary and Accountant.

Hull and Barnsley and Great Central Joint Committee, Secretary and Accountant.

Metropolitan and Great Central Joint Committee, Secretary (for alternate 5-year periods).

North Lindsey Light Railways, Secretary and Accountant.

Nottingham Joint Station Committee, Secretary and Accountant.

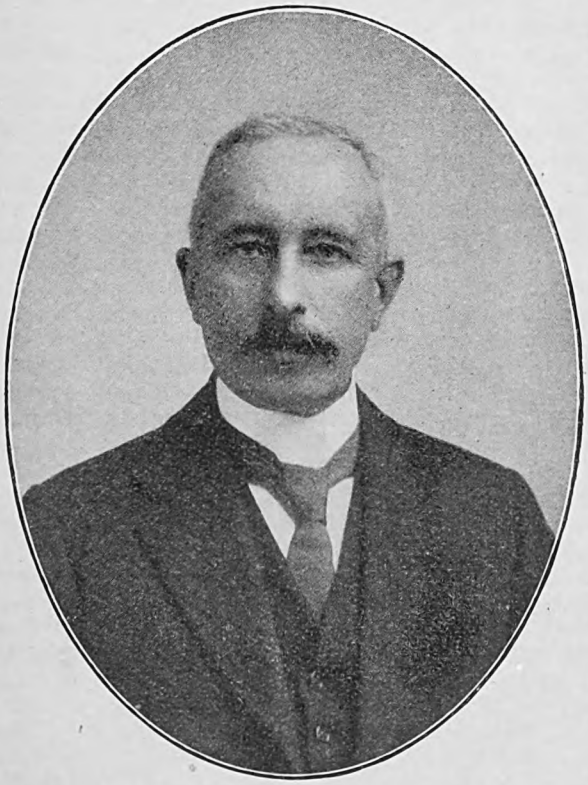
Wrexham and Ellesmere Railway, Secretary and Accountant.

[Mr. Holt is also a Conservator of the River Dee.]

Humber Commercial Railway and Dock Company (lessor to the Great Central Railway), Secretary and Accountant.

There is also the Humber Graving Dock and Engineering Co., Ltd., an entirely separate concern in which, however, the Great Central Railway is interested, of which Mr. Campbell is the Secretary, while Mr. Holt, previously secretary, is now a Director. Mr. Holt also holds the appointment of Secretary of the Seaforth and Sefton Junction Railway, while some of his earlier appointments of the same class have ceased to apply because of amalgamation, as in the case of the Blackpool Railway, the Wigan Junction, Liverpool and St. Helen's, Oldham, Ashton and Guide Bridge, and North Wales and Liverpool lines.

The duties pertaining to the accounts of these various joint lines, covering as they do so many different systems of accountancy in order to correspond with those in operation upon the several Companies interested, are necessarily very important, and it is obvious, therefore,



MR. G. F. STOTT.

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that the assistant responsible for this branch of the Secretarial Department must be a man of proved capability. The fact that Mr. William Slade—who three and thirty years ago succeeded in this office Mr. W. H. Edge, by whom he was trained—has filled this most important position for so long a period, eloquently bears its own testimony.

Other joint lines and committees are officered by representatives of other companies concerned, but the Secretary's Joint Line department is, of course, as much concerned with these as with those on which Mr. Holt holds official position.

On the Great Central Railway the Chief Accountant, Mr. R. Rigby, as also the Audit Accountant, Mr. H. M. Bowden, are virtually independent officers; but as Cashier Mr. Holt is brought into close touch with them, and in practice the respective departments necessarily work together. In this connection Mr. Holt has a Chief Cashier, Mr. J. W. Lawton, with headquarters at London Road station, Manchester, being more convenient for the major portion of the system, with a Sub-Cashier in London, Mr. H. S. Butterworth. The latter office is formed more particularly to deal with the cash received and paid out along the southern section of the system, and virtually the whole of the Cashier's department is concentrated at Manchester, both Manchester and London paying in or paying out on the instructions of the Secretary and his direct staff, who are responsible for the accounts as they affect headquarters. Mr. Holt is, in fact, the final receiver of revenue whatever its origin, and it is through him that all wages, and salaries and payments are made. That is, he issues all paying-out cheques, authorised by the directors and countersigned by himself, and it is only on this basis that other departments, agents, stationmasters, etc., can pay out. Distribution is effected through the Cashier's department.

In Manchester Mr. Lawton has a clerical staff concerned with the issue of all payment cheques, wages cheques, etc.; receipts of all kinds; ledger accounts; and the general clerical work associated herewith, although the detail work of accounting may be done by the accountant's department. Mr. Butterworth deals with this work as regards the southern division, and is associated directly with headquarters, except in so far as co-operation with Manchester is essential.

In Manchester there is another division, that dealing with Pension Funds, Provident Societies and the like usual with all large companies. Here Mr. G. F. Stott has a staff concerned with these and kindred matters. These include allowances and pensions paid by the company, as well as the conduct of the various agencies to which the men contribute or which are mutual between the company and the staff. It also covers the National Insurance, war allowances and the like. Much of the detail work of this character is done by the staff section of the General Manager's department, and there are secretaries of various societies; but wherever the company is concerned in payments, and in respect of contributions and receipts, the financial aspects have to be dealt with by Mr. Stott and his assistants.

Although it has not required a great deal of space to set forth the general character of Mr. Holt's responsibility and the work of his assistants and their staffs, it will be obvious that the large scale and wide ramifications of a leading railway company's activities and operations entails that each section involves duties of considerable magnitude. Stations and goods depôts are numbered by hundreds, and many of them take thousands of pounds daily, besides paying out on a corresponding scale, and dealing with goods and other traffic accounts in enormous numbers and in endless variety. There are numbers of trade arrangements to take into account, while traffic receipts are complicated by the fact that with so many of them the Railway Clearing House has to allocate due proportions. Salaries and wages have to be paid out to many thousands of individuals, and there are the accounts of the Chief Mechanical Engineer's, Engineer's, Marine and other departments also to be dealt with, besides the accounts and payments associated with the stores departments. Detail work is, of course, largely done by the accountant's departments, and by the accounting staffs of various special departments; but in respect of stock and share registration, payment of dividend warrants, issue of new capital and related matters the Secretary's department is concerned with detail as well as general work.

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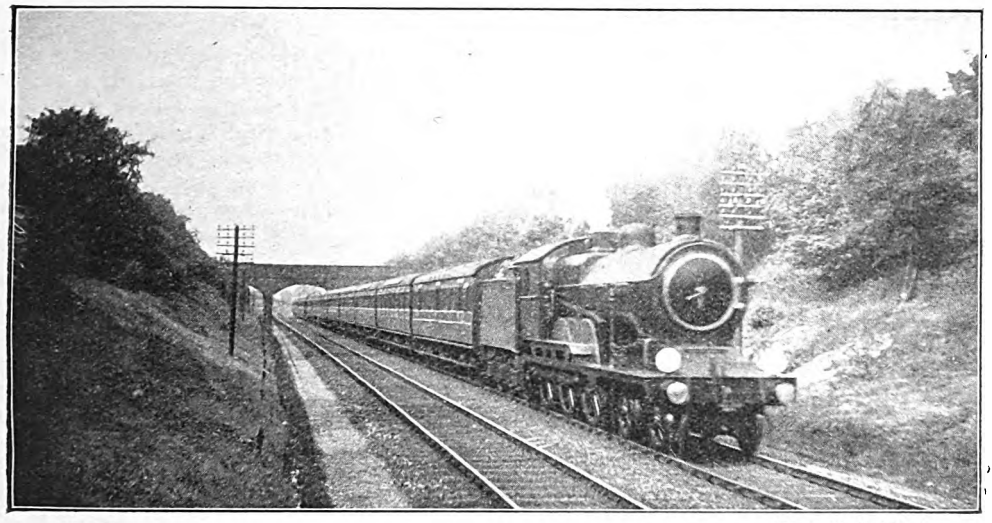

Photo] [*K. A. C. R. Nunn.*

GREAT EASTERN RAILWAY.
1.0 p.m. Cromer–Liverpool Street express near Shenfield.
4–6–0 superheater engine No. 1505.

British Locomotive Practice and Performance.

By CECIL J. ALLEN.

IT is customary that a portion of the first article in the New Year should be devoted to a brief review of locomotive developments in the preceding twelve months; and in the present case the period in question, although overshadowed by the gigantic struggle on the Continent, still in progress, and hampered by the ever-increasing demands of that conflict on the industry of the country, has been by no means barren of interest. No very startling or revolutionary locomotive designs have made their appearance, it is true, although several of the new designs and also the experimental conversions and rebuildings of the year have been noteworthy in more respects than one.

The number of new express locomotive types has been few. Mr. P. Drummond has added to his large-boilered 6 ft. 4–4–0 engines on the Glasgow and South Western Railway a further series of six, the latest examples being equipped with both the Schmidt superheater and the Weir feed-pump and heater. These engines are intended for service between Glasgow and Carlisle, and are among the heaviest 4–4–0 locomotives in the kingdom, weighing with tenders over 109 tons in working order. On the Great Northern Railway of Ireland, Mr. G. T. Glover, the Locomotive Superintendent, has designed some 5 ft. 9 in. 4–4–0 express engines with a view more particularly to working the heavily graded north-western or Dundalk-Omagh-Londonderry section. Five of these engines have been built, and owing to load limitations they have at present only received comparatively small boilers of 4 ft. 3 in. diameter, although they have standard parts and frames suitable for equipment with the large standard boiler at a later date. These are the first locomotives in Ireland to be fitted with the Robinson superheater.

The proximity of the Midland and South Western Junction Railway to the various military camps on Salisbury Plain has also necessitated an addition to the locomotive stock of that line, in the shape of two 4–4–0 express engines, with 5 ft. 9 in. wheels, built to the designs of Mr. J. Tyrrell. An unusual feature of these locomotives is the arrangement of the Ross muffled "pop" safety valves and the Swindon top-feed on a second or subsidiary dome, mounted on the third ring of the boiler, and giving quite an odd appearance. Two important new types

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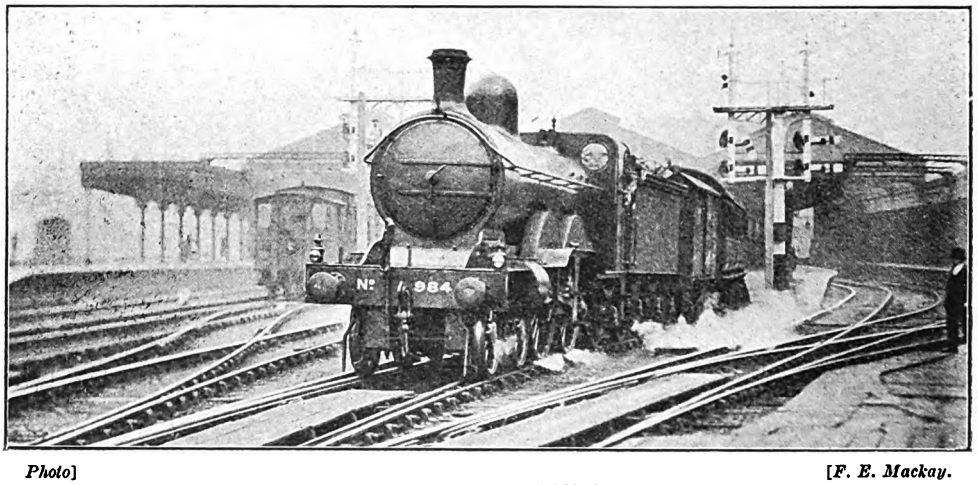
awaited with interest are Mr. E. A. Watson's four-cylinder express engines on the Great Southern and Western Railway of Ireland (not yet completed), and Mr. F. G. Smith's engines of the same wheel arrangement, but with two cylinders only and very large boilers, on the Highland Railway. Two of the latter engines have been transferred to the Caledonian Railway by arrangement.

Among the express locomotive conversions of the year the most striking are unquestionably the four-cylinder machines that have issued from Crewe and Doncaster respectively. Mr. C. J. Bowen Cooke's rebuild is No. 1361, *Prospero*, a 4–6–0 engine of the "Experiment" type, which originally had two cylinders 19 in. diameter by 26 in. stroke. These have now been replaced by four high-pressure cylinders 14 in. diameter, which all drive on the leading coupled axle. The piston valves are arranged with one valve spindle to each pair of cylinders, and by setting the inside and outside cranks at an angle of 180° in relation to each other, the valves give inside admission to one cylinder and outside admission to the other of each pair. Consequently the valve-gear is no more complicated than in the case of a two-cylinder engine, and as the valves for each two cylinders are on the same spindle the port openings of these cylinders are exactly equal. This arrangement is the patent of Mr. C. F. Dendy-Marshall. *Prospero* has at the same time been fitted with the Schmidt superheater. On the Great Northern Railway Mr. H. N. Gresley has rebuilt one of the standard Ivatt "Atlantics"—No. 279—with four high-pressure cylinders 15 in. diameter by 26 in. stroke, and has fitted the engine with the Robinson superheater. The cylinder dimensions constitute a revolution in Great Northern express locomotive practice, the aggregate piston area being over 12 per cent. greater than in the case of the ordinary superheater "Atlantics," with their two 20 in. cylinders, while the stroke is increased from the time-honoured Great Northern figure of 24 in. to 26 in. Walschaert's gear is used for the piston-valves of the outside cylinders, those of the inside cylinders being actuated by a rocking shaft. All cylinders drive on the trailing coupled axle, the inside cylinders being raised and inclined to clear the leading axle. Both these interesting locomotives are reported to be doing good work on their trials.



Photo] [*F. E. Mackay.*

GREAT NORTHERN RAILWAY.

Leeds–London express leaving Leeds (Central).
4–4–2 engine No. 984.

There have been various other rebuildings on different lines during 1915, mainly in connection with the adding of superheater equipment. Perhaps the most striking of these, as expressive of a considerable change in equipment, are the London and South Western engines of various types that have been fitted with the Eastleigh superheater by Mr. R. W. Urie. These include No. 335—one of Mr. Drummond's 6 ft. 4–6–0 engines, rebuilt to conform externally to Mr. Urie's latest 4–6–0 batch—Nos. 464 and 421, of the most recent and the previous large-boilered 4–4–0 classes respectively, and now No. 458, of Mr. Drummond's 6 ft. 7 in. 4–6–0

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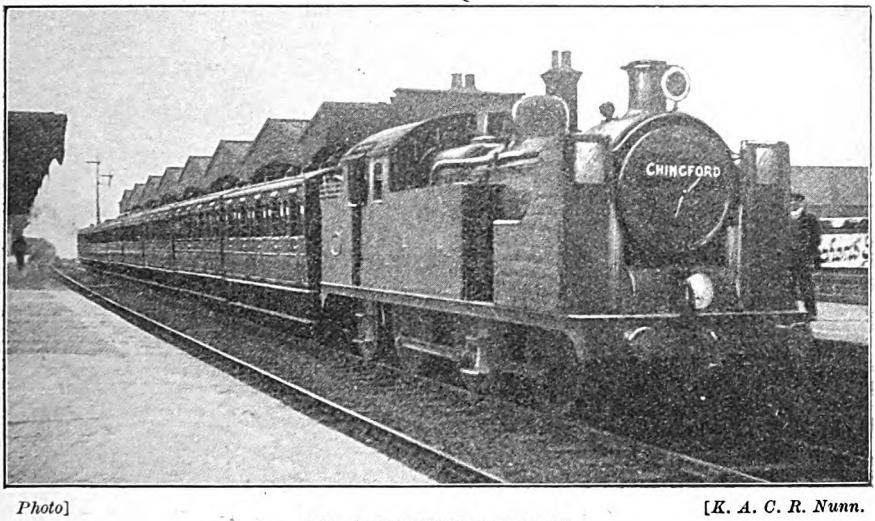
type. With these locomotives of varied types, from which the Drummond water-tubes and steam drier have been removed, an exhaustive comparison of the different methods of steam raising should be obtainable. On the Midland Railway the five original compounds of Mr. S. W. Johnson's design—Nos. 1000 to 1004—are being equipped with superheaters and rebuilt so as to be indistinguishable externally from the later Deeley compounds. Mr. A. J. Hill, on the Great Eastern Railway, is experimenting with the Weir feed-pump and heater, having so equipped No. 1791—a non-superheater 4–4–0 of the "Claud Hamilton" class—and No. 1240, a superheater 0–6–0 goods engine, while a further rebuilding on the same line has been that of two of the original "Claud Hamilton" engines of the first batch—Nos. 1896 and 1898—with Belpaire boilers, new cabs and Robinson superheaters. Elsewhere superheating has been proceeding apace on almost every line, some recent equipments of note including that of a North British "Atlantic," and also of one or two of the first North Eastern "Atlantics" of Class V, not forgetting also the two four-cylinder Smith compounds of the same company—Nos. 730 and 731.

Among the new goods locomotives of 1915 perhaps the most interesting has been the series of ten designed by Mr. Matthew Stirling for the Hull and Barnsley Railway, five of which are arranged to use saturated, and five superheated, steam. The latter have a modified arrangement of the Schmidt superheater, which renders unnecessary the use of either dampers or draught retarders, as the regulator is placed in the smokebox and so arranged that when it is in the closed position the superheater tubes are kept full of steam. Directly the regulator is opened, therefore, superheated steam is admitted to the cylinders. These engines follow the usual Stirling tradition in the matter of domeless boilers. Other new engines of the same wheel arrangement include ten large and powerful superheater locomotives of Mr. W. P. Reid's design for the North British Railway, and also a handsome 0–6–0 tender engine of generous proportions for the Belfast and County Down Railway of Ireland, designed by Mr. R. G. Miller. The number of users of the Mogul or 2–6–0 wheel arrangement has also been increased recently by the addition of the Glasgow and South Western Railway, on which Mr. P. Drummond has introduced some powerful engines of this type, fitted with the Robinson superheater.



Photo] [*K. A. C. R. Nunn.*

GREAT EASTERN RAILWAY.

1.52 p.m. Liverpool Street–Chingford train at Bethnal Green Junction.
0–6–2 superheater tank engine No. 1001 fitted with indicator shelters for trial purposes.

In the matter of new tank locomotives there has been great activity, and some notable designs have resulted. Foremost among these are Mr. J. G. Robinson's mineral tank engines on the Great Central Railway, with the unusual 2–6–4 wheel arrangement. These powerful engines have 21 in. by 26 in. cylinders and 5 ft. 1 in. coupled wheels, with the most modern

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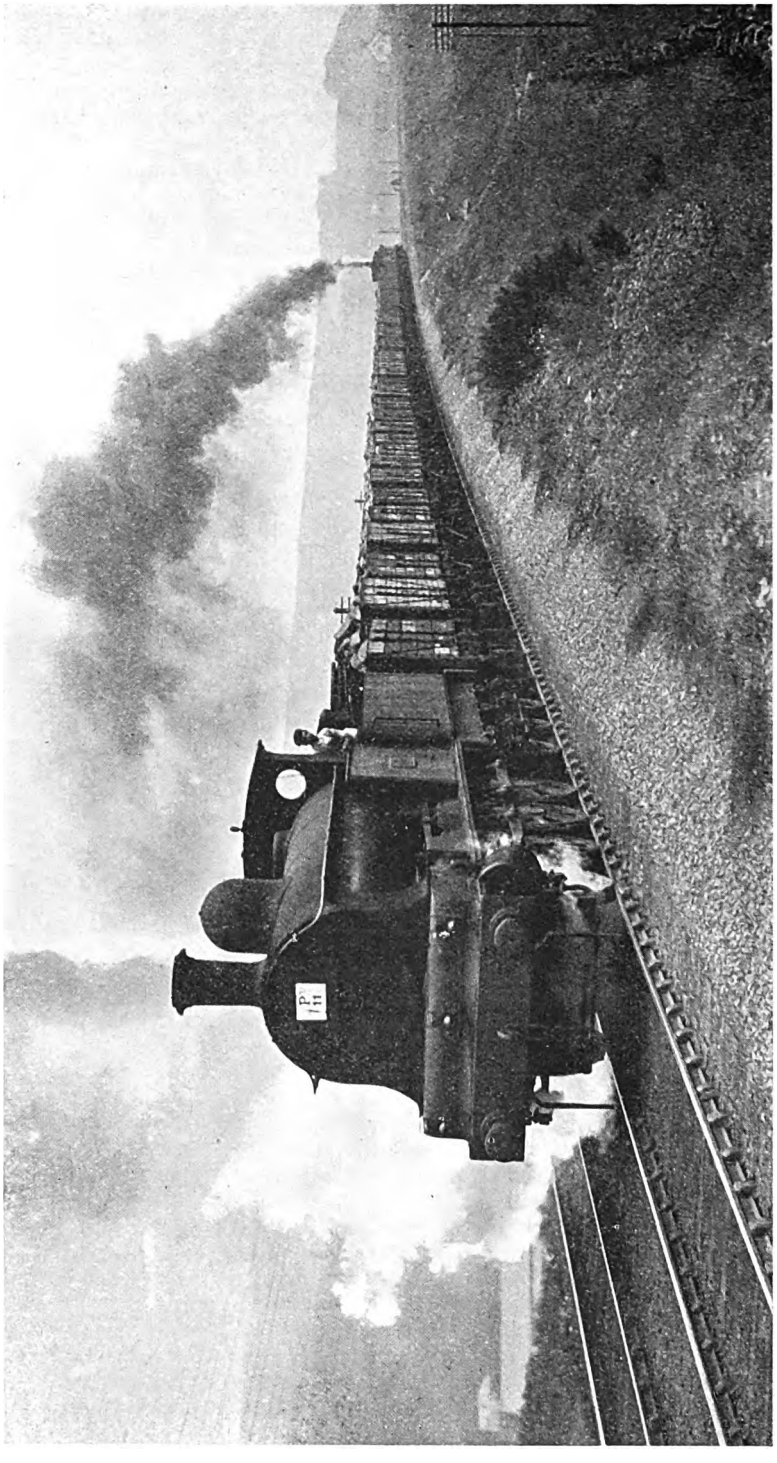

Photo] A "JELLICOE SPECIAL": COAL FOR THE GRAND FLEET. [F. E. Mackay

London and North Western Railway coal train ascending Shap, with supplies for the North Sea Fleet.
[The train is drawn by a four-cylinder compound coal engine No. 500, with an ordinary goods engine banking behind.]

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equipment, as the Robinson superheater, Swindon top-feed arrangement, duplicate water scoops for each direction of running, together with steam heat connection and an ejector for the vacuum brake when working passenger trains. In working order each engine weighs no less than 96½ tons. Another revolutionary design is the 0–6–2 tank engine by Mr. A. J. Hill, on the Great Eastern Railway, of which type two have been built, one with superheater and one

LONDON AND NORTH WESTERN RAILWAY: CREWE–CARLISLE.

4-cylinder 4–6–0 superheater engine No. 668, *Rupert Guinness* (Driver J. Jones).

Load: 428 tons empty, 450 tons full (62 axles).

Distance.	Stations.		Schedule.	Actual.
Miles.			Mins.	M. S.
0	Crewe	dep.	0	0 00
4⅞	Minshull Vernon ..	pass	—	8 10
11⅞	Hartford	,,	—	14 45
16¼	Weaver Junction ..	,,	18	18 40
21¼	Moore	,,	—	23 05
24⅛	Warrington	,,	27	25 35
27⅝	Winwick Junction..	,,	31	28 55
30	Golborne Junction..	,,	34	31 25
35⅞	Wigan	,,	40	38 00
				*
39¼	Standish Junction	,,	44	42 40
41¾	Coppull	,,	—	47 45
45½	Euxton Junction ..	,,	51	51 30
51	Preston‡	,,	58	57 15
55¾	Barton	,,	—	64 30
63¾	Scorton	,,	—	72 20
72	Lancaster	,,	81	80 15
78¼	Carnforth	,,	88	85 45
82¾	Burton	,,	—	90 10
85½	Milnthorpe ..	,,	—	92 55
91⅛	Oxenholme¶	arr	pass	99 50
		dep.	101	102 20
98¼	Grayrigg	pass	—	115 15
104½	Tebay	,,	117	121 30
109¾	Shap Summit ..	,,	127	130 15
123¼	Penrith	,,	141	143 30
141	Carlisle	arr.	159	160 30
141	Net time (mins.) ..		159	157½

* Severe permanent way check.
‡ Service slack: 15 miles per hour.
¶ 2–4–0 pilot attached.

without—the first engines of this wheel arrangement on the Great Eastern Railway. Other new designs have been Mr. J. Auld's handsome 0–6–4 tank engines of the Barry Railway and Mr. J. Cameron's latest 0–6–2 tanks on the neighbouring Taff Vale line; Mr. E. A. Watson's notable 4–8–0 shunting tanks on the Great Southern and Western Railway of Ireland; Mr. W. F. Pettigrew's new 4–4–2 and 0–6–0 tank engines on the Furness Railway, and Mr. L. Billinton's most recent class of 0–6–0 tank engines for the London, Brighton and South Coast Railway. It is noteworthy that almost all the engines mentioned in this and the last paragraphs, although primarily intended, in most cases, for goods and mineral working, are equipped

GREAT WESTERN RAILWAY: BIRMINGHAM–LONDON.

4-cylinder 4–6–0 superheater engine No. 4,004 *Morning Star*.

	Full.	Empty.	Axles.
Load: To Hatton ..	430	406	59
,, ,, Warwick ..	380	358	51
,, ,, Leamington	350	330	47
,, ,, London ..	230	217	28

Distance.	Stations.		Schedule.	Actual.
Miles.			Mins.	M. S.
0·0	Birmingham ..	dep.	0	0 00
				*
3·2	Tyseley	pass	—	8 05
5·1	Olton	,,	—	10 35
10·3	Knowle	,,	—	16 00
12·8	Lapworth	,,	—	18 10
17·1	Hatton	slip	20	21 45
21·2	Warwick	,,	24	25 10
23·2	Leamington	arr.	26	27 50
0·0		dep.	0	0 00
6·1	Southam Road ..	pass	—	8 30
				†
11·1	Fenny Compton ..	,,	—	15 20
16·2	Cropredy	,,	—	20 05
19·9	Banbury	,,	22	23 05
				‖
24·9	Aynho Junction¶ ..	,,	27	27 55
30·2	Ardley	,,	—	33 15
34·0	Bicester	,,	—	36 30
40·0	Brill	,,	—	41 20
43·2	Ashendon Junction¶	,,	44	44 25
47·3	Haddenham ..	,,	—	48 30
52·7	Princes Risborough	,,	54	53 55
58·6	West Wycombe¶ ..	,,	—	59 55
60·8	High Wycombe¶ ..	,,	63	62 55
65·7	Beaconsfield ..	,,	—	68 20
70·0	Gerrard's Cross ..	,,	—	72 30
75·3	Ruislip	,,	—	76 45
79·6	Greenford	,,	81	80 10
82·9	Park Royal.. ..	,,	—	83 05
				‡
87·4	Paddington ..	arr.	91	90 40

Net times: Birmingham-Leamington, 25 min.; Leamington-London, 87½ min.

¶ Service slacks. * Permanent way slack, long and severe.
† Signals, severe. ‡ Signals, Royal Oak, severe.
‖ Signals, King's Sutton, slight.

with the continuous brake, for working passenger trains when required. Finally it should be mentioned, as a sign of the times, that two of the leading railway companies are compelled to patronise outside builders for locomotive stock, the London and North

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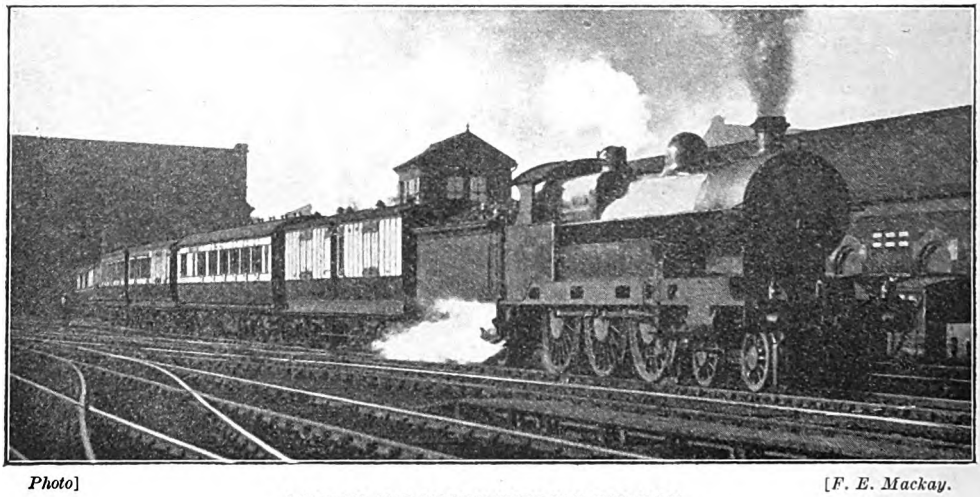
Western—for the first time in its history—having so ordered twenty 4–6–0 superheater "Prince of Wales" class engines and twenty 0–8–0 superheater goods engines, and the Great Northern twenty 2–6–0 "Moguls" of the 1640 class for mixed traffic service. So much, then, for the constructional developments of 1915.

Into the express train services of the country the war has made serious inroads, but even yet it must be admitted that we are astonishingly well provided with travelling facilities under the circumstances—better so, probably, than most other countries of the world were before any state of war existed. Such curtailments as have been made have been designed principally to do away with overlapping on competitive routes, and by special as well as existing arrangements for the interchangeability of tickets the loss to the Metropolis has not been serious, although some provincial towns, as for example those on the Midland main line, are substantially worse off. The Midland cancellations, indeed, are the most serious of any, including as they do the majority of the crack trains, such as the 10 a.m. and 5.35 p.m. departures from St. Pancras to Manchester, and the 1.57 p.m. and 7.55 p.m. arrivals from the same place; the 3.30 p.m. from St. Pancras to Leeds, and both the 10.15 a.m. and the fast portion of the 1 p.m. from Leeds to London, due at 2.10 and 4.45 p.m. respectively; and also the 1.30 p.m. express from St. Pancras to Edinburgh and Glasgow, with the corresponding up trains due at 10.30 and 11.15 p.m. In the last-mentioned instance the loss has been palliated by the provision of a special express from Leeds at 6.30 p.m. to Sheffield, Trent, Leicester and London, due at 10.35 p.m. Through travellers, as previously mentioned, suffer but little from these cancellations, the London and North Western Company having regular expresses to and from Manchester at very much the same times as the suspended expresses, the Great Northern Railway to and from Leeds and Bradford, the Great Central to and from Leicester, Nottingham and Sheffield, and both West and Coast Routes in the case of the lost Scotch expresses. Fortunately these trains are for the most part noted in the working time-tables as "suspended," and we shall thus hope to welcome their reappearance in more prosperous and settled times. The same remarks apply in the case of other temporarily vanished expresses, as the 6.5 p.m. from King's Cross to Hull and the 2 p.m. from Leeds to London, Great Northern Railway; the 10.35 a.m. East Coast "semi-fast" *ex*-King's Cross and the corresponding return train due at 8.35 p.m.—two very useful trains which have now been reinstated north of York, but remain cancelled between York and London; the 12.30 p.m. from Liverpool Street, Great Eastern Railway, to Yarmouth, Lowestoft and Cromer, and the up express from these places due at 1.55 p.m., together with certain Cambridge line trains; the 4.10 p.m. from Waterloo to



Photo] [*F. E. Mackay.*

LONDON AND NORTH WESTERN RAILWAY.

4.22 p.m. Glasgow–Euston express leaving Carlisle.
4–6–0 four-cylinder locomotive *Rupert Guinness.*

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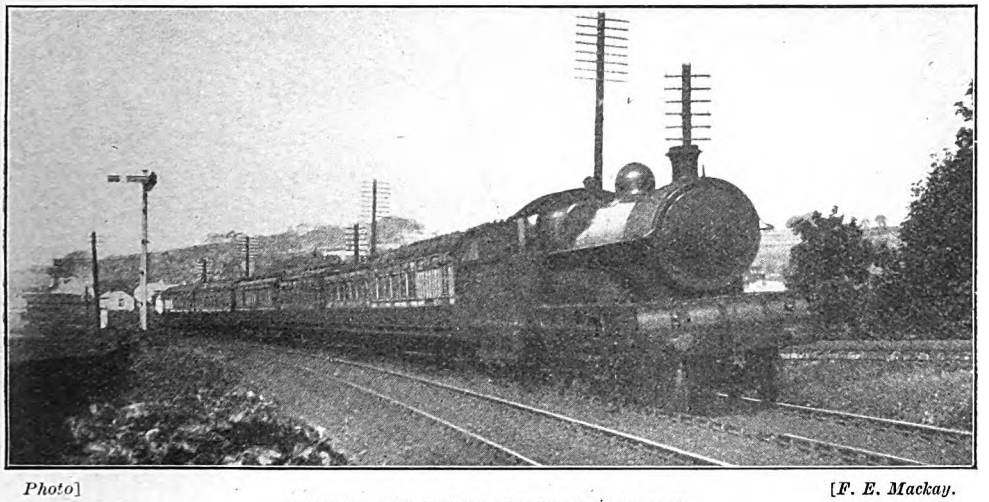
Weymouth, and the 2 p.m. from Bournemouth to Waterloo—to name some of the most serious losses among the cancelled trains.

Although, as has been remarked in the last paragraph, the trains mentioned are merely considered as "suspended," a disquieting feature of the current time-tables is the deceleration of expresses on certain lines, which is more likely to remain permanent. Of the Great Eastern decelerations I wrote in the November issue of last year, but these are not so momentous in that they merely embody a reversion in part to previously existing times. On the other hand we have on the London and North Western and Lancashire and Yorkshire Railways decelerations of express trains from times which have been standard for years past. The former company, it must be confessed, has yielded to *force majeure*. It was no longer possible for unpiloted engines to cope with the formidable loads to which such important expresses as the 10.30 a.m., 12.10 noon, and 2.40 p.m. to Liverpool and Manchester, or the 5.30 p.m. to Birkenhead and Fleetwood, were daily made up, on such fast bookings. The last time I travelled by the 10.30 a.m. down we had 61 axles, 427 tons tare weight, and 450 tons full, while the 5.30 p.m. had no less than 62 axles of the latest stock, weighing 443 tons empty, and fully 465 tons with passengers and luggage, and I was not surprised that an unpiloted "Poet" on the latter run took 151¾ min. to Stafford, the excess of ¾ min. on the new booking being accounted for by a signal check just before the stop. On the former journey a "Claughton"—No. 2046, *Charles N. Lawrence*—lost 5 min. 10 sec. to Tring, owing to a permanent way check at Bushey and the heavy load, but regained 2 min. on the old schedule thence to Crewe, despite ultra-cautious speed reductions at Rugby and Stafford, and signals approaching Crewe. I considered the time of 123 min. 25 sec. on this run for the 121⅝ miles from Tring to Betley Road an exceedingly good one with a load of 450 tons, especially as it included Rugby and Stafford slacks.

Now, however, the 10.30 a.m., 12.10 noon, and 2.40 p.m. down expresses have all been altered to leave 5 min. earlier, and a uniform time of 3 hours is allowed for the 158 miles' journey to Crewe in each case. The 5.30 p.m. down is started at 5.20 p.m. and correspondingly decelerated, 9 min. extra being now allowed to Stafford, and the 6 and 6.10 p.m. Liverpool and Manchester "non-stops" each start 5 min. earlier and have 10 min. added to their journey times. The midnight Scotch expresses in each direction have been subjected to a still more drastic deceleration. Certain of the up expresses, notably the 9.45 a.m. and 5.25 p.m. from Liverpool and the 10.15 a.m. and 6.15 p.m. from Manchester have received corresponding treatment. Such changes are indeed melancholy to record, but the necessity for them, especially in view of the traffic temporarily diverted from the Midland route,



Photo] [*F. E. Mackay.*

LONDON AND NORTH WESTERN RAILWAY.

12.18 p.m. *ex*-Carlisle up express passing Penrith.
4-6-0 four-cylinder engine *W. E. Dorrington.*

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is manifest. Despite this, however, some of the most difficult locomotive "turns" still remain. There is the undivided 10 a.m. Scotch express *ex*-Euston, which from Crewe onwards furnishes an extremely severe test of an unpiloted locomotive's capabilities; I shall have more to say of this presently. The corresponding up train retains its time of 3 hours from Crewe to Euston, inclusive of a stop of 4 min. at Rugby. The 2.10 p.m. and 4.10 p.m. trains from Manchester and the 2 p.m. and 4.5 p.m. from Liverpool keep their original times from Crewe, despite heavy loads, while a still more heavily weighted express—the 11 a.m. *ex*-Liverpool and the 12.5 noon *ex*-Crewe—is still run on its original timing. Add to these the two-hour Birmingham expresses, which, as we saw in last month's article, now load at times quite respectably, and it will be found that the London and North Western Railway still offers a field of almost unabated interest to the recorder of locomotive performance.

Far more sweeping than the London and North Western time-table modifications just described have been those of the Lancashire and Yorkshire Railway, as the latter affect every train of note on the system. First and foremost, the famous 40-min. service between Manchester and Liverpool is no more, the time by every train having been increased to 45 min. If, as is by no means improbable, this is a permanent alteration, the country will lose one of the most brilliant bookings that it has ever known. But at the same time the change is, on every ground, a practical one; the essential feature of a business service such as this should be punctuality in operation, and the absence of any margin whatever on the previous standard time for 36¾ miles of 40 min. to recover delays or deal with any loads over the very lightest was liable to make strict time-keeping at all times more or less problematical. At the same time the London and North Western service between Manchester and Liverpool has been ruthlessly pared down, and the fastest time increased from 40 to 45 min., so that the even ¾-hour becomes now the standard time by all three routes between the two cities—Lancashire and Yorkshire, London and North Western, and Cheshire Lines Committee. Further than this the times of all the business expresses between Manchester and Blackpool and Manchester and Southport have been increased by varying amounts up to 7 or 8 min.—again perhaps a justifiable increment in view of the necessity for strict punctuality and the extreme difficulties of the two routes. The main Yorkshire line does not witness many changes, the principal of these being a

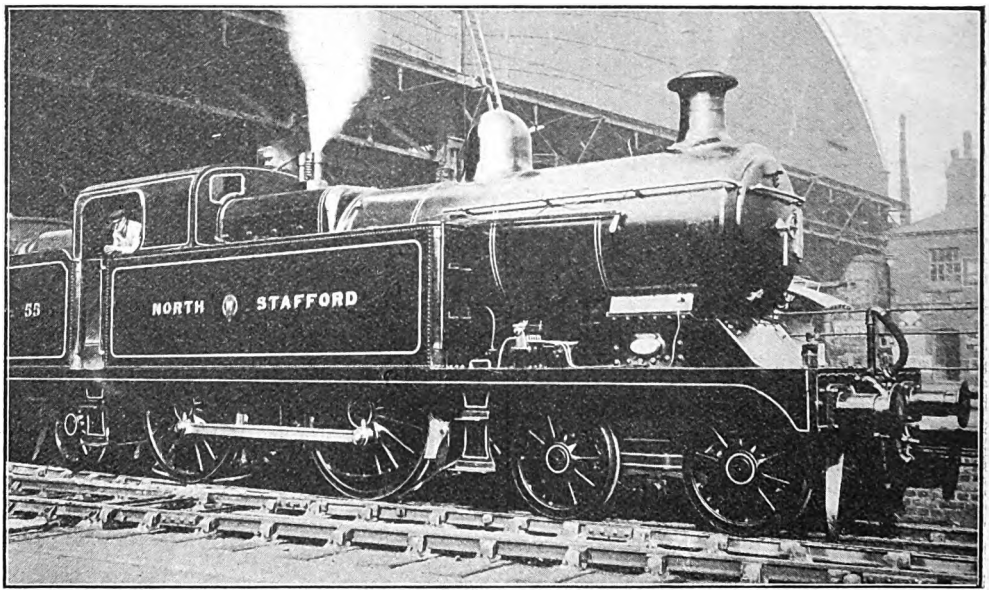

Photo [*W. H. Whitworth.*

NORTH STAFFORDSHIRE RAILWAY.

4-4-2 superheater tank engine No. 55, at London Road, Manchester.

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much-needed addition of 5 min. to the 2.35 p.m. express from York to Manchester, in view of the extra Todmorden stop, and a similar increase between Manchester and Brighouse for the 2.55 p.m. (now 2.50 p.m.) express to Hull and York. These are the principal alterations to train services that have taken place during the year 1915.

It has been my custom for a year or two past to devote the first article of a New Year's issue to a record of my "best runs" during the year just expired. In the present case I fear that many of these runs have already appeared in print and that limitations of space will not allow any further reference to them, but I have reserved the descriptions of several journeys of more than usual merit to adorn the columns of the present issue. The first of these was made on the London and North Western Railway, and on a train which, as I remarked a little while ago, in its undivided state offers a formidable task of haulage to an unpiloted engine—the 1.12 p.m. from Crewe to Carlisle, booked to cover the 141 miles between the two towns in 159 min. My good fortune was to find this train, on a day in early summer, loaded up to no less than eleven 8-wheelers and three 12-wheelers—mostly of the latest stock—and hauled by the four-cylinder 4-6-0 engine No. 668, *Rupert Guinness*, which was in charge of driver J. Jones. The latter has the best of reputations, but his work was indeed "cut out" on this occasion to keep time with a train weighing 428 tons empty and fully 450 tons inclusive of a heavy complement of passengers and luggage. I have set the run out in tabular form, but some comment on its leading features is necessary.

The start was magnificent, driver Jones setting out at once to regain the two or three minutes of arrears with which we had left Crewe, and with no further encouragement than 3½ miles down at 1 in 400 and 1 at 1 in 330 we were doing 69·2 miles per hour at Hartford. On the slight ascent from Weaver Junction we fell to 64·3 miles per hour, but the rate increased to a sustained 72·5 miles per hour after the 1½ miles down at 1 in 180, and the gradual descent therefrom that leads to Moore troughs. So at Warrington we had already gained nearly 1½ min. on booked time. It may be added that the speeds over Weaver

MIDLAND RAILWAY: WELLINGBOROUGH–LONDON.

Engine: Rebuilt 4-4-0 superheater No. 553.
From Bedford: 4-2-2 engine No. 642.
Load: 17 axles = 100 tons.

Distance.	Stations.		Schedule.	Actual.
Miles.			Mins.	M. S.
0	Wellingborough	dep.	0	0 00
2¼	Irchester	pass	—	3 50
5¼	Summit	,,	—	7 30
8¼	Sharnbrook	arr.	cond.	11 15
		dep.	stop	12 20
12	Oakley	pass	—	17 15
15¼	Bedford¶	arr.	pass	21 05
		dep.	18	23 30
23¼	Ampthill	pass	—	33 45
27¾	Harlington	,,	—	38 20
32¼	Leagrave	,,	—	43 15
34¾	Luton	arr.	41	45 55
		dep.	45	49 20
37¾	Chiltern Green	pass	—	54 35
40¼	Harpenden	,,	—	57 15
45	St. Albans	,,	57	61 35
49¾	Radlett	,,	—	65 10
52½	Elstree	,,	—	67 40
55½	Mill Hill	,,	—	70 20
58	Hendon	,,	70	72 15
61½	Finchley Road	,,	*	75 05
63½	Kentish Town	,,	78	77 20
65	St. Pancras	arr.	82	79 55

¶ No. 553 engine failed; No. 642 attached.
* 2 min. allowed to recover delays.

GREAT EASTERN RAILWAY: LIVERPOOL STREET–PRITTLEWELL.

Engine: 4-4-0 No.	‡1797	1829
Load (axles) ‖	33	36
Load (tons)	220	235

Distance.	Stations.		Schedule.	Actual.	Actual.
Miles.			Mins.	M. S.	M. S.
0·0	Liverpool St.	dep.	0	0 00	0 00
1·1	Bethnal Gn.	pass	—	3 25 ‖	3 20 ‖
4·0	Stratford¶	,,	8	7 55	8 00
7·3	Ilford	,,	—	12 25	Sigs.
10·0	Chadwell H.	,,	16	15 20 *	Sigs.
12·4	Romford	,,	—	19 10 †	Sigs.
18·2	Brentwood	,,	—	30 00	Sigs.
19·3	Ingrave	,,	—	32 05	Sigs.
20·2	Shenfield¶	,,	31	33 25	35 20
21·6	Mountnessing	,,	—	35 25	37 15
24·4	Billericay	,,	—	38 20	40 15
27·2	Ramsden Bellhouse	,,	—	41 10	43 05
29·0	Wickford	,,	41	42 50	44 35
30·2	Fanton	,,	—	44 05	45 35
33·1	Rayleigh	,,	—	47 15	48 35
36·1	Hockley	,,	—	50 55	52 25
38·7	Rochford	,,	—	53 00	54 45
40·9	Prittlewell	arr.	55	55 10	57 05
40·9	Net times (mins.)		55	50½	51½

¶ Service slacks. ‡ Superheater engine.
* Signals, severe. † Signal stop, Romford advanced starter.
‖ Signals, Bow Junction, slight.

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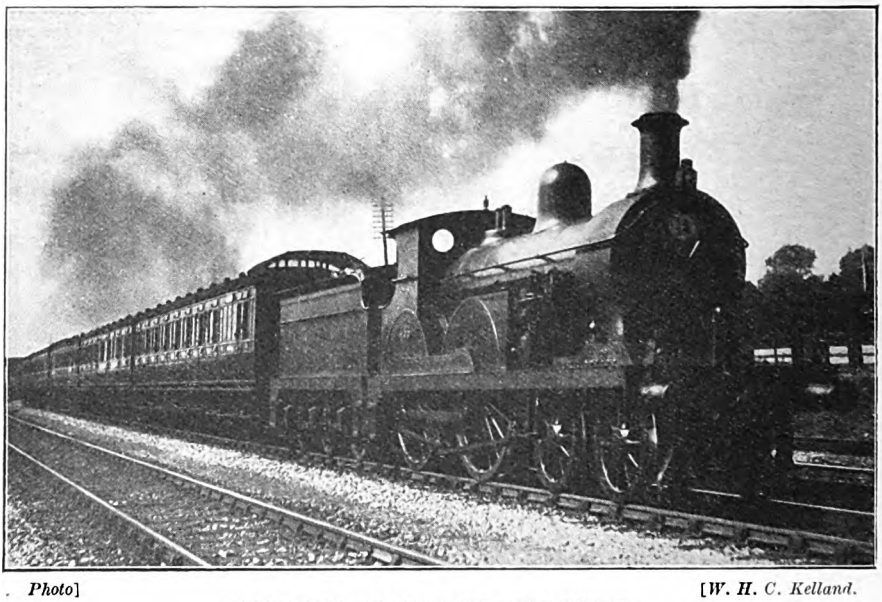
Junction and through Warrington were somewhat higher than usual, but the vehicle in which I travelled rode with the utmost smoothness and comfort throughout. On the rise to Golborne, continuous from Warrington and partly at 1 in 132, the speed fell to 51·1 miles per hour, although on the level grades beyond we recovered to 58·5, and so passed Wigan with a clear 2 min. in hand on schedule, and practically on time. The subsequent severe permanent way check at Standish Junction was very unfortunate, and, coming as it did in the middle of the severe Boar's Head bank, from Wigan to near Coppull, it sufficed to lose us 3 min., and just prevented us from keeping end-to-end time. Consequently at Euxton Junction our gain on schedule time had vanished, but by smart running on to Preston, with a maximum of 69·2 miles per hour at Farington, Jones took us through that town in ¾-min. under the time allowed, despite the delay.

As for the work performed between Preston and Lancaster, I considered it quite the finest of the journey. It is not easy to recover rapidly from Preston slack with an initial rise at 1 in 95, and 2¾ miles beyond that adverse at 1 in 500, but the time of 7¼ min. from Preston to Barton was very good, and the 2¾ miles down at 1 in 1060 and 2 at 1 in 640—barely easier than level—to Brock troughs raised the speed to 61·3 miles per hour. From here for 11 miles the line is all but level, but with a gradually rising tendency, including 5 miles up at 1 in 1060 and 1½ at 1 in 660, and here speed was splendidly maintained, as on the last-mentioned piece it did not fall below 60·8 miles per hour. The rate through Lancaster was moderate, but along the seashore at Hest Bank we were doing 71·4 miles per hour, and so passed Carnforth with 2¼ min. in hand, or 5¼ min. net, allowing for Standish slack. Up the 2¼ miles at 1 in 131 beyond Carnforth we only fell to 52·9 miles per hour, but the 1½ miles down at 1 in 280 beyond brought us again to 61·6 miles per hour. I was quite hopeful that Jones might essay the ascent to Shap unassisted, but he preferred not to do so, and the fateful two "crows" as we approached Oxenholme heralded a stoppage at that junction for a pilot. But we had made the start-to-stop run of 91⅛ miles from Crewe in 99 min. 50 sec., or rather under 97 min. net, which, as the booking allows 101 min. to passing, instead of stopping, was a really wonderful feat with so enormous a train, especially as the intermediate grades are by no means over-easy. The vertical rise between Crewe and Oxenholme, indeed, is fully 700 ft.

At Oxenholme a 2-4-0 "Jumbo," whose name and number I omitted to ascertain, was attached, and quite an excellent finish to



Photo] [*W. H. C. Kelland.*

SOUTH EASTERN AND CHATHAM RAILWAY.

Rebuilt Stirling 4-4-0 engine No. 455 on down train.

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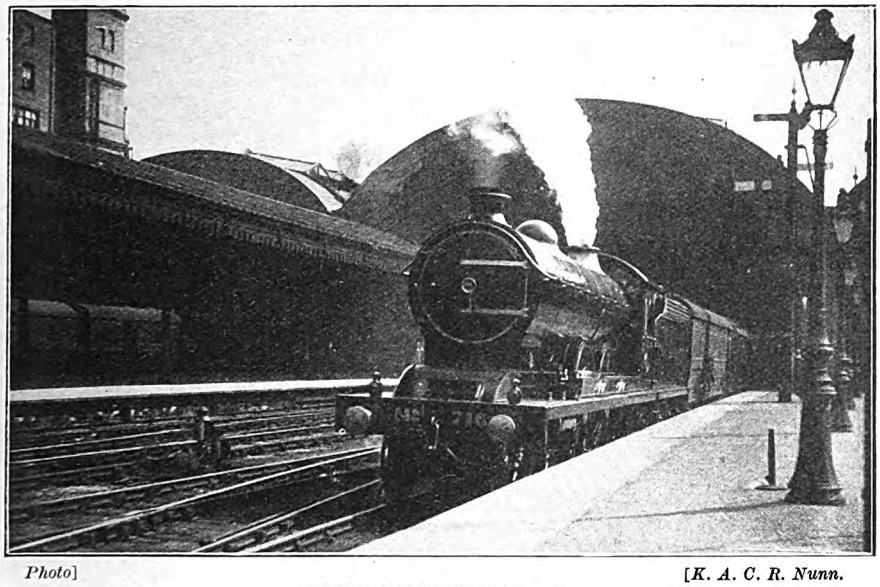
the journey followed, even though, dividing the load in the proportion of 2 to 1 the "Claughton" with 300 tons and the "Precedent" with 150 tons each had quite a respectable tonnage to tackle. Despite this, the speed rose to just over 40 miles per hour on the 105–120–133 from Oxenholme station, and fell only to 37·2 on the final 2 miles at 1 in 100 to Grayrigg. A speed of 65·2 miles per hour was attained at Tebay, and the two engines then climbed the 1 in 75 to Shap Summit with a minimum rate of a fraction under 27 miles per hour. From there a very easy descent was made to Carlisle, speed being most moderate to Penrith, where a severe slack was made, but after that a top speed of 75 miles per hour was touched in two places. Thus the two engines covered the 49⅞ miles from Oxenholme to Carlisle in 58 min. 10 sec., or in only 10 sec. over the booked time from passing Oxenholme to the destination. Inclusive of both Standish check and 2½ min. standing at Oxenholme, we had only lost 1½ min. on the time allowed from Crewe to Carlisle—a feat for which driver Jones in particular deserves warm commendation. Curiously enough, when I was on the same train a week before, the load being almost identical, *i.e.*, 416 tons empty, 435–440 tons full, 58 axles, the driver of a "Claughton" whose name and number I omitted to note *did* take Grayrigg bank unassisted. But the circumstances were very unpropitious, a west wind and a drizzling rain combining with delays from a troop train ahead to cause substantial loss of time. A clear road was not obtained until beyond Standish, and then, despite the adverse weather conditions, the engine just held its own, gaining 20 sec. on schedule from Euxton Junction to Oxenholme. The ascent of Grayrigg bank was quite phenomenal, a speed of 37·5 miles per hour being maintained up the earlier portion, while 33·8 miles per hour was the minimum speed on the 1 in 100. But it was not worth while attempting the ascent of Shap under such conditions, and we stopped beyond Tebay, therefore, for assistance in rear to the summit. Our time from Preston to Tebay, in each case passed very slowly, was exactly 62 min., which is the time allowed the heavy 2 p.m. *ex*-Euston. The times of the 1.12 p.m. *ex*-Crewe, of course, were framed for the Glasgow portion only of the 10 a.m. from Euston, and to observe them under such onerous conditions of loading is more than creditable.



Photo] [*K. A. C. R. Nunn.*

NORTH EASTERN RAILWAY.

10.0 a.m. King's Cross–Aberdeen express leaving York.
Three-cylinder superheater locomotive No. 716.

From the London and North Western Railway I pass to the Great Western Railway. In doing so I am reminded of a postcard received recently from an indignant reader, who asks, "Why do you so seldom give us any Great Western Railway work? Your

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'exceptional' runs on all these other railways are done by every train on the Great Western Railway and many trains on the Great Western Railway have to do better in order to keep bare time." I fear that the enthusiasms of my friend are rather more dogmatic than I can myself subscribe to, while they would hardly seem to be tempered with the knowledge of running conditions that alone could afford the authority for such sweeping asseverations. Moreover he counsels me, in support of his statements, to "try the 8.2 a.m. up off Bath for Paddington"—a train which I find on reference to Bradshaw does not exactly take the world by storm in point of speed, nor should experience the extraordinary difficulty to which my friend refers in keeping "bare time." In point of fact, most of my recent runs on the Great Western Railway—as, indeed, on many lines under present conditions, which are not generally conducive to record-breaking—have been decidedly disappointing, and in several cases I have noted time lost on crack expresses with only moderate loads, for no apparent reason. But at the same time it cannot be disputed that modern Great Western locomotives, with their high working pressure and generous proportions, are capable of exceedingly fine—indeed, of remarkable—work when capably handled. And, as an example of such work, I have tabulated herewith the details of a run on a 2-hours express from Birmingham to London, made under somewhat extraordinary conditions of loading, which I enjoyed on a recent Saturday.

The train in question was the 12.15 noon *ex*-Snow Hill, which, in addition to its two substantial portions for London and Reading respectively, on Saturdays conveys also slip portions for Hatton and Warwick. Consequently, when we left Birmingham the train was made up to no less than fourteen 8-wheelers and one 6-wheeler, or 59 axles. This load totalled 430 tons behind the tender, and all the hardest part of the journey to Leamington had to be made before the first reduction of load took place at Hatton. The early stages of the run were completely spoiled by the prolonged and severe slowing over the widening works at Bordesley, which lost us the customary impetus from the brief ¼-mile at 1 in 43 out of Snow Hill station. But from Tyseley the speed picked up splendidly, and we went up the gradually rising grades to Solihull—partly at 1 in 223–339—at a sustained speed of over 52 miles per hour. The level or faintly falling stretch to Knowle raised the rate to 62·5 miles per hour, while the succeeding Kingswood bank—4 miles down mainly at 1 in 228–273—produced a maximum of 75 miles per hour. Finally on Hatton bank we touched 80·3 miles per hour, and then, with a careful reduction of speed through Warwick, we drew up at Leamington with a loss of barely 2 min. on schedule, which was more than accounted for by the initial delays. In virtue of the tremendous load conveyed from the start, this was a notable fine feat.

From Leamington to London the performance over the remainder of the journey, although excellent, did not perhaps fully attain to that just described, as there was now left but little more than half the original train. Southam Road bank was attacked in great style, *Morning Star* accelerating up its continuous 1 in 187 grade to 55 miles per hour, and covering the initial 6·1 miles to that station in 8½ min., despite the fact that the adverse grade starts quite steeply from Leamington itself. Immediately after Southam Road there was a very severe signal check, from which the engine once again accelerated finely up the 3¼ miles at 1 in 239–256 past Fenny Compton to no less than 58·5 miles per hour. At Banbury we were doing 71·4 miles per hour, and had only lost a minute from Leamington, despite the check; at King's Sutton, however, another slight check intervened, although the latter did not cause serious loss. The lowest speed on the 1 in 200 rise from Aynho Junction to Ardley Tunnel was 52·9 miles per hour, and we then touched 78·9 on the similar descent past Bicester. At Ashendon Junction we slacked to 50 miles per hour, touching 64·3 miles per hour on the undulating stretch before Haddenham, and not falling below 55 on the 1 in 290 ascent to Princes Risborough. The final 1 in 167 ascent through the Chilterns was compassed with no lower speed than 50 miles per hour exactly, and we then touched 72·5 before slacking carefully through West and High Wycombe. Once again there followed some magnificent acceleration, the speed rising to 57·7 miles per hour on the 2½ miles of level out of Wycombe, and not falling below 55·6 on the 1 in 225 ascent beyond to Beaconsfield. Once over the summit we ran swiftly down to Denham, touching a maximum of 78·9 miles per hour, and maintaining an average of about 74 thence until about Greenford, after which various delays into Paddington prevented us from arriving in more than 20 sec. under the time allowed. But in any

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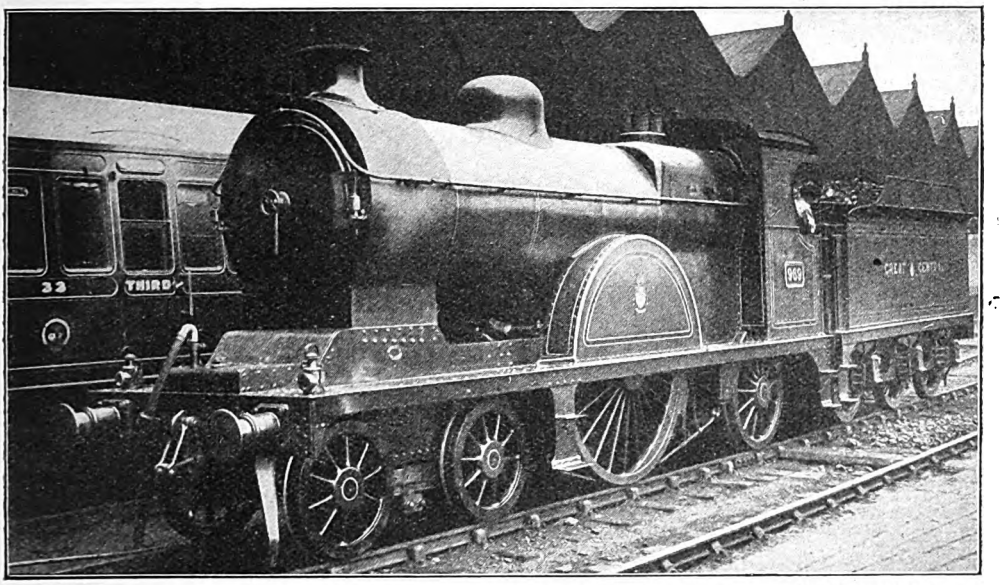
case the requirements of the booking are decidedly onerous, and the driver did quite well to have gained all but 2 min. from Banbury to Greenford with a very fair load. Allowing for delays, the economy of 3½ min. on schedule left the net running time from Leamington to London virtually "even," while it is worthy of note that the 71·8 miles from Fenny Compton to Park Royal, inclusive of four slacks of varying intensity, were covered in 67¾ min.

I give the next run, on the Midland Railway, not so much in virtue of the brilliance of its times, the load being very light, as on account of the praiseworthy work put up by locomotive now over 23 years old and at the very shortest of notice. As will be seen from the tabular presentation of the run, we left Wellingborough with a modest load of 100 tons, in charge of one of the 4–4–0 superheater rebuilds, No. 553. The engine went gaily up Irchester bank, almost as though it were not there, not falling below 46 miles per hour on the last 2¾ miles at 1 in 120, and so covered the 8¼ miles to Sharnbrook conditional stop in 11¼ min. Another smart start followed, Oakley, 3¾ miles further, being passed in 4 min. 55 sec., but as we approached Bedford it became evident that the engine was in difficulties, and thus we were compelled to pull up, the 7 miles from Sharnbrook having taken only 8¾ min., start-to-stop. In an almost unbelievably short space of time—what line *could* beat the Midland in the production of pilots at short notice ?—No. 553 was taken off, and No. 642, a Johnson 7 ft. 6 in. 4–2–2 engine built in 1892, and ably handled by driver W. J. Newman, of Bedford shed, was substituted. The whole stop only lasted 2 min. 25 sec., and Newman then set out to give us some quite remarkable running. A speed was maintained continuously of 52·9 miles per hour on the long 1 in 200 rise to Ampthill, and after a brief spell at 62·5 on the 1½ miles of easy grades to Flitwick, we settled down to a steady 55 miles per hour on the 5½ miles at 1 in 202 that culminate at Toddington summit. Beyond Leagrave we touched 64·3 and so pulled up at Luton in the noteworthy time of 22 min. 25 sec. from Bedford—35 sec. less than the time allowed from *passing* Bedford at full speed. Remarkable work, this, for an engine 23 years of age, even though the load were light, seeing that the vertical rise from Bedford to Luton is something like 320 ft. Starting again from Luton, we passed Harpenden, 5½ miles, in 7 min. 55 sec., and after that we fairly "romped" home. At St. Albans the speed had risen to 71·4 miles per hour, and at Radlett it was 80·3 ; the 3 miles up at 1 in 200 to Elstree reduced it to 64·3 miles per hour, and then through Hendon we again touched 77·5



Photo] [*W. H. Whitworth.*

GREAT CENTRAL RAILWAY.

Single locomotive No. 969, rebuilt with large boiler.

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miles per hour. So the 26¾ miles from Luton to Finchley Road were covered in 25¾ min. from the start (of which distance the 16½ miles from St. Albans were covered in 13½ min., at an average of 73·3 miles per hour) and with a smart finish we succeeded in reaching St. Pancras in 30 min. 35 sec. from the start—only just over "even time" and in 6 min. 25 sec. less than the time allowed. Perhaps the most noteworthy feature of the run was that, despite the conditional stop and the extra stop at Bedford, there were still over 2 min. to spare on the booking from Wellingborough to London, although, owing to a late start, we were a little late on arrival. For the lion's share in this achievement driver Newman deserves hearty congratulation.

Finally, I give details of the two best runs I have had on the Great Eastern Railway during the past year, and they were made on the service that often affords more interest to the timing enthusiast than any other that the Great Eastern Railway has to offer—that in operation between Liverpool Street and Southend-on-Sea. Both runs were made on the down "tea train"—whose dainty service and very moderate tariff add an additional interest to the running!—the first on the week-day schedule, leaving Liverpool Street at 5.18 p.m., and the second on the Saturday times that operated during last summer, 12 min. later. On the first trip, with the superheater 4-4-0 No. 1797 and 220 tons, we got away smartly, despite a signal check at Bow Junction, and passed Chadwell Heath well before time, at a speed of 54·5 miles per hour. But then signal checks intervened—first a bad slowing at Romford Junction, and then a momentary dead stand at Romford station advanced starting signal. From the latter we picked up well, accelerating up 3 miles at 1 in 356–358–507 to 45·5 miles per hour beyond Harold Wood, and not falling below 31·5 miles per hour at Brentwood bank. Shenfield, however, was passed nearly 2½ min. behind time, very slowly, with the hardest part of the journey ahead. On the descent to Mountnessing we touched 64·3 miles per hour, and then went up the 1½ miles at 1 in 100 past Billericay with no lower minimum than 50. Ramsden Bellhouse bank was taken cautiously, the highest speed being 64·3 miles per hour, so that there was no substantial gain of time to Wickford. On the 2 miles at 1 in 100 to Rayleigh summit we fell to 51·7 miles per hour, but finally on the 2½ miles' descent of Hockley bank we touched 77·5 miles per hour, finishing brilliantly at Prittlewell in only 10 sec. over the time allowed. In view of the severity of the intermediate gradients, this economy of 2¼ min. on the fast booking from Shenfield to Prittlewell was quite praiseworthy.

But on the second run, made only a week later, we exactly duplicated this feat, although the engine was a non-superheater—No. 1829—and the load was up to the maximum of 36 axles allowed on these trains. On this occasion also we passed Stratford on time, but the 5.23 p.m. Cromer express was evidently delayed, and so blocked us all the way from Manor Park to Ingrave. In this way the arrears of time at Shenfield were rather more than could be regained, but a gallant attempt was made. At Mountnessing the speed was only 60·8 miles per hour, and at Billericay summit 45·5, but down Ramsden Bellhouse bank we ran steadily at 75 miles per hour, and so beat the times of the previous run from Shenfield to Rayleigh by 35 sec. The subsequent speeds, however, were not so high, the minimum at Rayleigh summit being 40·9 miles per hour, and the maximum past Hockley 73·8, so that the times of the two runs between Shenfield and Prittlewell exactly tied with each other. Both runs, however, were equally deserving of commendation, as the loads conveyed in each case were quite substantial, in view of the character of the road traversed. Indeed, the Southend services of both the Great Eastern Railway and its competitor—the Midland—are well worthy of attention from the performance standpoint—an attention that I hope to be able to give them rather more in the future than I have had the opportunity to do in the past.

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Locomotive and Train Working in the latter part of the 19th Century.

GREAT WESTERN RAILWAY. [No. III.]

The Last Years of the Broad Gauge.

By E. L. AHRONS, M.I.Mech.E., M.I.Loco.E.

(*Continued from page* 447, *December*, 1915, RAILWAY MAGAZINE.)

THE single express engines were not, however, the only broad gauge locomotives at Bristol shed. I have already mentioned the 2015 to 2024 class of 6 ft. 6 in. coupled engines used principally on the fast goods trains, and there were also some four or five of the "Avonside" class similar to the *Acheron*. I think these were principally employed in piloting trains west of Bristol, and occasionally, though infrequently, they assisted the 3 p.m. from Bristol to Swindon.

There were a number of broad gauge goods trains west of Bristol, only two of which worked through on the London side. The others came from Plymouth, etc., as far as Bristol, and their contents were transhipped for the Midland Railway or for South Wales, Shrewsbury, etc. To work these there was a fair number of 0-6-0 engines, which were of three classes. The first consisted of 14 engines, Nos. 2077 to 2090, most of which were at Bristol. They had originally been Great Western Railway Swindon-built engines dated 1865-6 and of Mr. Armstrong's design. They were afterwards sold to the Bristol and Exeter Railway, and on the acquisition of this line by the Great Western Railway they reverted to their former owners, but instead of their previous Great Western Railway names, *Birmingham*, *Bath*, etc., received much more prosaic numbers. They had 5 ft. wheels and 17 in. by 24 in. cylinders.

In 1886 it was decided to convert some of them to standard gauge engines and the drawings for the conversion of 2077 were made, but the plan was abandoned. This was not surprising, for only a short time afterwards an opposite course had to be adopted and ten standard gauge engines altered to broad gauge.

Of this latter or second type there were twenty, Nos. 1196 to 1215, of which 1206 to 1215 had run as broad gauge engines from about 1883, and the other ten were converted in 1886-7. In reality they were Mr. Armstrong's standard double framed narrow gauge goods engines with the wheels outside both sets of frames. Like nearly all other Great Western goods engines, they had 5 ft. wheels and 17 in. by 24 in. cylinders with 140 lbs. pressure, and could be distinguished by the addition of the usual standard gauge brass domes, which were absent in almost all broad gauge engines. The only domed exceptions which I remember were the three Bristol and Exeter four-coupled passenger engines 2025 to 2027, and one or two shunting engines of the South Devon Railway.

The third class of 0-6-0 tender engine consisted of the solitary survivor of what had once been a fairly numerous class of Gooch's Great Western engines. By the end of 1884 all these engines had disappeared, but the *Europa*, the only one remaining, had had the good fortune to receive a new boiler in 1869. I believe this engine lasted until the abolition of the broad gauge.

There were therefore during the last eight years about 35 tender goods engines of the 0-6-0 type, 20 being "convertibles." Most of them were stationed at Bristol, Newton Abbot and Plymouth, and worked almost exclusively between those places. Bristol was also the proud possessor of a nondescript Bristol and Exeter shunting engine, a six wheels coupled saddle tank engine of a disreputably ugly design, though comparatively powerful, having 17 in. by 24 in. cylinders, and wheels only 3 ft. 6 in. diameter. It frequented the neighbourhood of Pylle Hill and sorted out the broad gauge tranship

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trucks. A second engine of the class was either at Newton Abbot or Plymouth.

A few broad gauge engines were stabled at Taunton. Of these some half a dozen were 6 ft. coupled tender engines of the "Avonside" or "Acheron" classes, which were used for piloting passenger trains from Taunton up the Wellington bank as far as Whiteball Siding, of which work there was a considerable amount, and they regularly worked on the Chard branch. The 12¾ miles from Creech Junction to Chard were entirely broad gauge, and when the other Bristol and Exeter branch lines were converted between 1880 and 1884 to standard gauge, the Chard branch was omitted. It was always stated that the reason for this was to prevent the great rival of the Great Western Railway, the London and South Western Railway, from getting any chance of obtaining running powers from Chard to Taunton. Anyway the Chard branch was converted only a few months before the final abolition of the broad gauge on the rest of the system.

This branch was also occasionally worked by one of the 4-4-0 bogie saddle tanks, which were so much in evidence west of Newton Abbot. The Bristol and Exeter had 26 of these engines, most of which were still at work, though when the branches were altered in gauge they were sent to work on the South Devon and Cornwall sections. Very rarely, though occasionally, they worked north of Exeter and it was one of them, No. 2051, which was running a special from Plymouth to Bristol containing passengers from one of the Cape liners that ran into a standing goods train at Norton Fitzwarren, 2 miles south of Taunton, on the night of November 11th, 1890. The standard gauge goods train had been shunted from the down to the up line to allow a down express to pass, and the signalman, who had forgotten it, "pulled off" for the Cape special with disastrous results, for No. 2051 ran full tilt and end-on into the goods engine, with the result that ten passengers were killed and many injured. This was, I believe, the last fatal train accident that occurred on the broad gauge.

On page 29 is illustrated a curious little broad gauge 2-2-2 tank engine of which a number worked various Bristol and Exeter Railway branch lines. They had disappeared by 1882 and are only illustrated here as a matter of general interest. There were four left to become Great Western property, taking the numbers 2054 to 2057. The single drivers were only 5 ft. 6 in. diameter and the cylinders of two of them were 12½ in. by 18 in., and of the other two 14 in. by 18 in. The engine illustrated, Bristol and Exeter Railway No. 53, had been built by Messrs. Rothwell & Co., of Bolton, in 1859, and was one of the 14 in. class.

BROAD GAUGE GOODS ENGINE NO. 2089.
2077-2090 class built at Swindon, 1865-6.

At this stage a few lines may be devoted to the broad gauge carriage stock. The main line coaches consisted of two types, both eight wheeled with clerestory roofs. The first type, dating between 1879 and 1883, were broad gauge coaches in fact as well as in name, and were very handsome roomy

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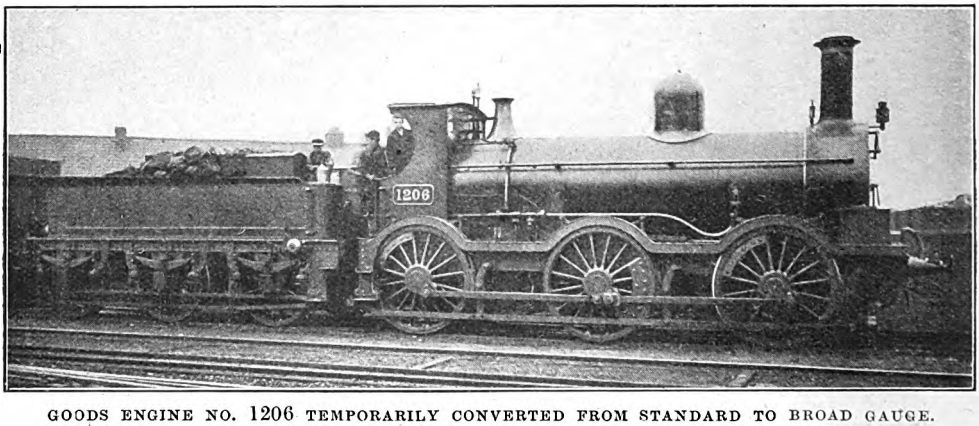
vehicles, of which the third class could seat seven on each side. They were not "bogies," for the Great Western Railway until about 1887 built their eight-wheelers on very similar lines to those of the London and North Western and Great Northern Railways, in which the two end axles had side play and the inside axles were rigid. The chain-hung spring gear of the Great Western stock caused a somewhat monotonous rattling noise, which became somewhat wearisome on long journeys.

The second type were "convertible" coaches with narrow gauge bodies and broad gauge underframes. The vacant space between the two along the side was filled in by a box-shaped platform. A number of these coaches, built prior to 1888, had the eight-wheeled lateral play arrangement mentioned above, but others were afterwards built with broad gauge bogies. The above types supplied the stock for all main line express trains.

The remainder of the carriage stock, mostly six-wheeled, was employed on the local trains and branches in the west, and had to be seen to be properly appreciated. They were utterly unlike anything else on wheels, except perhaps some of the choicest South Eastern specimens of that date, but the latter were four-wheeled. Many had the old style of windows with the lower ends rounded, a few had oval windows, and some hard-featured ones were built with everything at rigid right angles and square windows. Some of them were entirely of iron with flat roofs. Nearly all had the old fashioned wheels with open spokes, many of which were of the double elliptical pattern. They were not so much used north of Exeter, except on the Chard branch, but a few occasionally put in an appearance at Bristol, and Bridgwater yard generally had two or three of them in a siding to give the station an antique appearance. The weekly West of England excursions to and from London also frequently managed to collect a few, which were sandwiched between the eight-wheelers. Finally some of them, with the insides removed, served as brake vans for the broad gauge "Tip" and other goods trains.

Geographically the purely broad gauge South Devon and Cornwall sections began at Exeter, as the standard or mixed gauge terminated there. But as regards the locomotive working, the real point of change-over was transferred 20 miles further on to Newton Abbot. There were two reasons for this. Firstly, the old locomotive shops and large depôts of the South Devon Railway were at the latter place, and secondly the 20 mile section from Exeter to Newton Abbot was level, and therefore constituted a good road for the big wheeled "single" express engines. Consequently Exeter was in reality almost a standard gauge locomotive shed during the last years of the broad gauge, although I believe one or two broad gauge pilot engines of the "Avonside" or "Acheron" class were kept there in case of emergency.



GOODS ENGINE NO. 1206 TEMPORARILY CONVERTED FROM STANDARD TO BROAD GAUGE.

West of Newton Abbot the character of the railway completely changes, for nearly all the way thence to Penzance there are a succession of "terrific" banks, both up and down, varying from 1 in 41, making it the hardest road in the country. A great portion was "single line," and there were a considerable number of awesome wooden trestle viaducts, which caused an uncomfortable

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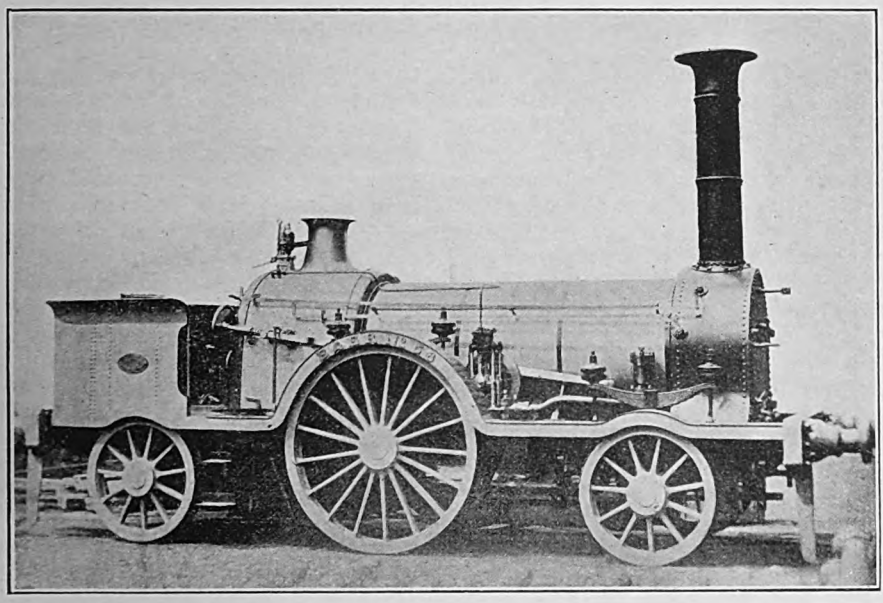
feeling when one travelled over them for the first time on the footplate.

The character of the railway was, of course, reflected in the locomotives. The "single" express engines were naturally absolutely prohibited. Whether the 8 ft. "Iron Dukes" could have taken their own weight up the Rattery or Hemerdon banks, it is difficult to say, but I do not think they were ever given the chance. Even tender engines of any class were rare visitors, the only exceptions being a few of the 0–6–0 goods engines which ran fast goods trains with strictly limited loads as far as Plymouth.

The express trains do not require extended mention. The up "Zulu" covered the distance of 112½ miles from Penzance to Newton Abbot in 3 hrs. 56 min., with eleven intermediate stops, which occupied a total of 37 min. The fastest runs were the 12¼ miles from St. Austell to Bodmin Road at 38·6 miles per hour, and Liskeard to Devonport, 16½ miles, at 36·6 miles per hour. Considering the sections of single line and the nature of the gradients, some of the speeds were very creditable.

The whole of the locomotive power was furnished by four-wheels coupled saddle-tank engines of the 4–4–0 and 2–4–0 types, and by six-coupled 0–6–0 saddle-tank engines for goods traffic. A few four-wheeled shunting engines served Plymouth Docks. The 4–4–0 passenger tank engines consisted of 40 South Devon engines (Great Western Railway, 2096 to 2135), of which 16 had 5 ft. 6 in. wheels and 16½ in. by 24 in. cylinders, and most of the remainder 5 ft. 8 in. or 5 ft. 9 in. wheels and 17 in. by 24 in. cylinders. There were also six similar engines which had been transferred from the old Vale of Neath Railway in South Wales. After 1883–4 an emigration and influx of the majority of the very similar Bristol and Exeter saddle-tank engines, Nos. 2028 to 2053, took place. There were 26 of these, all with 5 ft. 6 in. wheels and 17 in. by 24 in. cylinders. As far as outward appearance was concerned they might be counted amongst the ugliest engines which ever ran on wheels, and to the end most of the South Devon engines had no protection from the weather, though the Bristol and Exeter engines had a bent sheet-iron covering over the footplate.



OLD 2–2–2 TANK ENGINE: BRISTOL AND EXETER RAILWAY.

The bogies consisted of a heavy rectangular iron frame with diagonal cross stays connected to the centre socket, which formed the receptacle for a ball joint fixed to the engine. There was no side play, and the bogies were set back so that the leading wheels were almost under the centre of the smoke-box. Nearly all of the engines were without splashers, and the running board or platform made a circular sweep round the wheels, a form of design which made them

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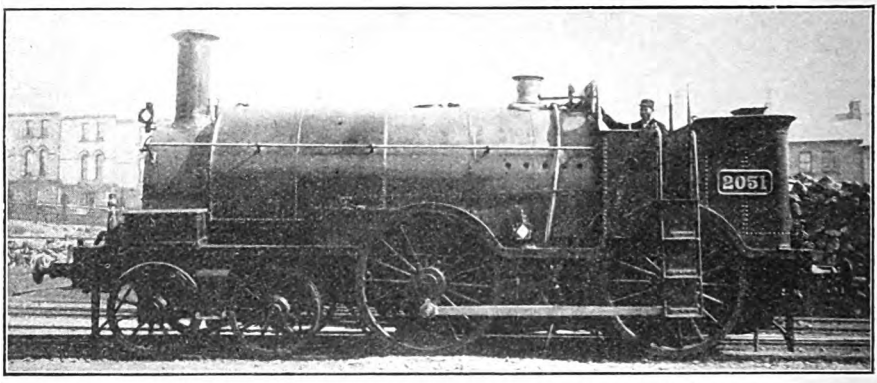
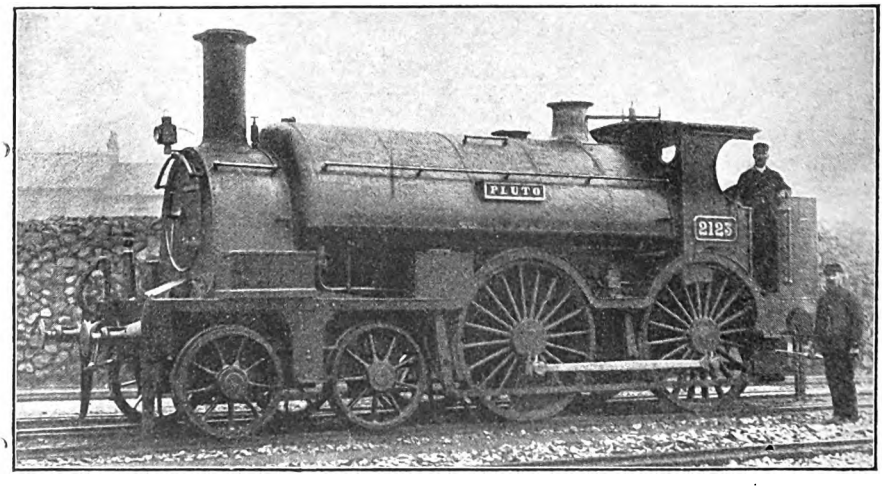


BRISTOL AND EXETER 4-4-0 TANK ENGINE NO. 2051.
Built by the Avonside Engine Co. in 1873; Coupled Wheels, 5 ft. 6 in. diameter, Cylinders, 17 in. by 24 in.
This engine was in the Norton Fitzwarren collision in 1890.

extremely awkward engines to get round. The only exceptions to this, as far as I remember, were two engines, 2134 *Heron* and 2135 *Magpie*, with 5 ft. 2 in. wheels, which were provided with closed splashers of the ordinary form, and the four last engines of the type to be built, Nos. 2128 to 2131 (named *Leopard*, *Stag*, *Lance* and *Osiris*), which had open splashers and a distinctly more prepossessing appearance. The above six engines were provided, in addition, with large cabs. All the passenger engines were domeless, and the sandboxes of some of the earlier South Devon engines were fixed on the top of the saddle tanks.

The 2-4-0 saddle-tank engines consisted of ten of the "Beyer" class, which were Great Western engines. Originally they were 6 ft. tender engines of the "Avonside" or "Acheron" class, but had been converted at Swindon into saddle-tank engines, whilst at the same time their coupled wheels had been reduced to 5 ft. diameter and the cylinders enlarged to 17 in. diameter. Two other 2-4-0 tank engines, the *Penwith* 2136 and *Prince* 2137, from the Cornwall railway, were much smaller branch line engines.

In 1880 there was, therefore, a stud of 72 4-4-0 and 12 2-4-0 broad gauge passenger tank engines, many of which were scrapped between 1882 and 1892, but a considerable number remained until the broad gauge curtain was finally rung down in May, 1892. The 0-6-0 goods tank engines had 4 ft. 6 in.



SOUTH DEVON RAILWAY 4-4-0 TANK ENGINE NO. 2123.
Built by the Avonside Engine Co., 1866; Coupled Wheels, 5 ft. 9 in. diameter, Cylinders, 17 in. by 24 in.

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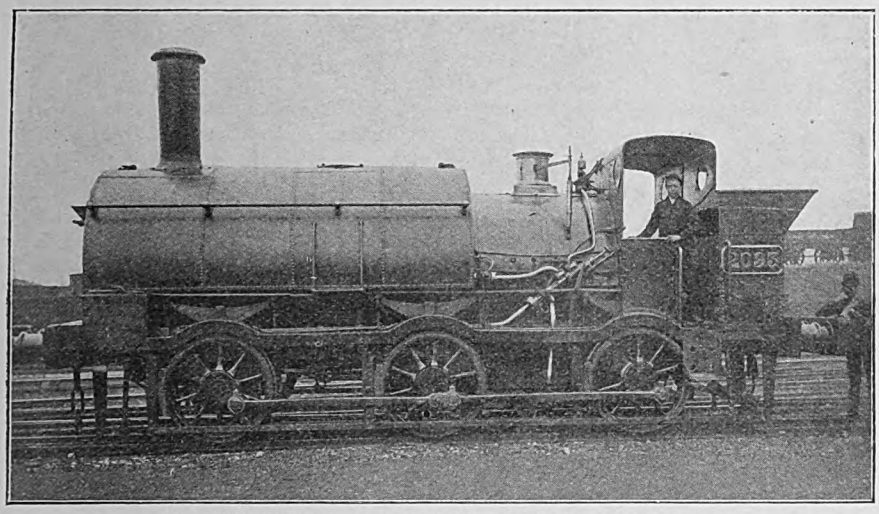
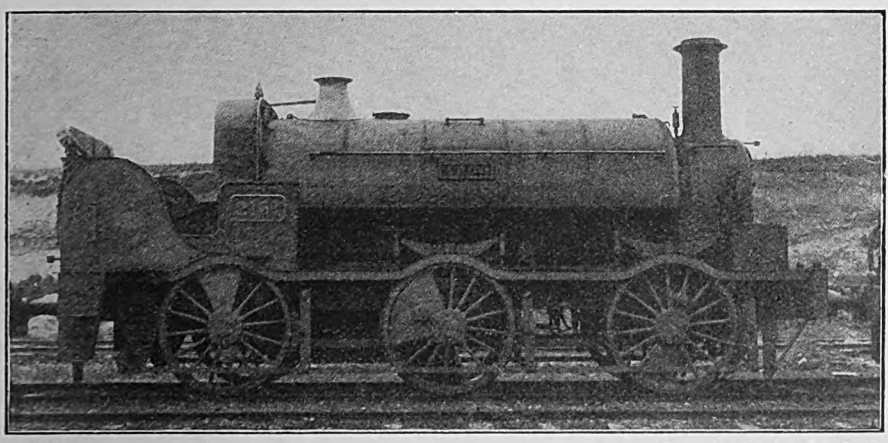


NO. 2093 BRISTOL AND EXETER SHUNTING TANK ENGINE.

or 4 ft. 9 in. wheels and 17 in. by 24 in. cylinders, except half-a-dozen which had 16½ in. cylinders. There were 35, of which six had been built at Swindon, and all the others by the Avonside Engine Co. at Bristol, except four old ones which came from the Vulcan Foundry, and one solitary specimen, No. 2156 *Redruth*, built by the West Cornwall Railway at their own works at Carn Brea. In addition to these, a few very similar engines had been transferred from the Vale of Neath Railway. These retained their old Vale of Neath numbers.

Originally the broad gauge terminated at Truro, to which city it had been opened in 1859, and in 1863 it was extended to Falmouth. Beyond Truro the West Cornwall Railway was a standard gauge line, but for the sake of convenience a third rail was added in 1868, and to work this new broad gauge addition the West Cornwall Railway exchanged four standard gauge tank engines with the Llynvi and Ogmore (South Wales) Railway, and received from them three 0–6–0 broad gauge saddle-tank engines.

Of the South Devon and Cornwall stock, four of the 4–4–0 passenger tank engines, Nos. 2128–2131, and ten of the 0–6–0 goods tank engines, Nos. 2160–2169, all of which had been built between 1872 and 1875, were "Convertibles," so that even at that comparatively early date the doom of the broad



Photo] [*Loco. Publishing Co., Ltd.*

SOUTH DEVON RAILWAY 0–6–0 SADDLE TANK ENGINE NO. 2151.

Built by the Avonside Engine Co. in 1863; Coupled Wheels, 4 ft. 9 in. diameter, Cylinders, 17 in. by 24 in.

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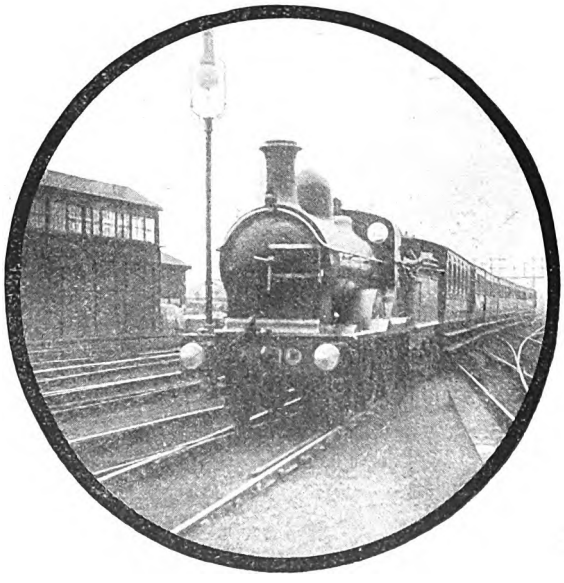
gauge was foreshadowed. Although all these "Convertibles" lasted until the final change in 1892, none of the 4–4–0 tank engines were converted, though nine out of the ten goods tank engines were so dealt with, the exception being engine 2163. After the conversion these took the standard gauge numbers 1317 to 1325.

There were also some four-wheeled shunting engines, mostly in use at Plymouth. Of these, No. 2171 *King* was converted to a standard gauge 2–4–0 engine (No. 2) as early as 1880, and the five outside cylinder engines were converted after the change of gauge in 1892. These were the *Raven*, *Rook*, *Crow*, *Lark* and *Jay*, and were distinguished by a wire gauze bonnet over the chimney cap.

Three inside-cylinder four-wheeled engines, the *Owl*, *Weasel* and *Goat*, had well tanks beneath the boiler between the frames, and the first two of these were also converted. The *Goat*, however, was not so fortunate. In 1884 it turned up at Swindon for repairs, and to that end its entrails were duly removed, and then seem to have been either mislaid or stolen. Anyway, they disappeared. Minus these, the *Goat* was used for a number of years in place of a sandwich buffer truck at Swindon Works, its function being to be butted about by a standard gauge engine during the endeavours of the latter to shunt broad gauge engines requiring repairs into the A shed. The *Goat* stood this for some years, and then resigned.

Finally, there was a broad gauge "coffee pot," a small four-wheeled shunting engine with a vertical boiler, 3 ft. wheels, and 9 in. by 12 in. cylinders, which was named *Tiny*, No. 2180. It was constructed in 1868 by a firm unknown as locomotive builders, Messrs. Sara & Co. This engine disappeared early in the "'eighties," and as it was one of the very few South Devon engines that I never saw, I am unable to give any further account of it.

(*To be continued.*)



Photo] [*K. A. C. R. Nunn.*

MARYPORT & CARLISLE RAILWAY.

Train from Whitehaven entering Carlisle.

2–4–0 locomotive No. 10.

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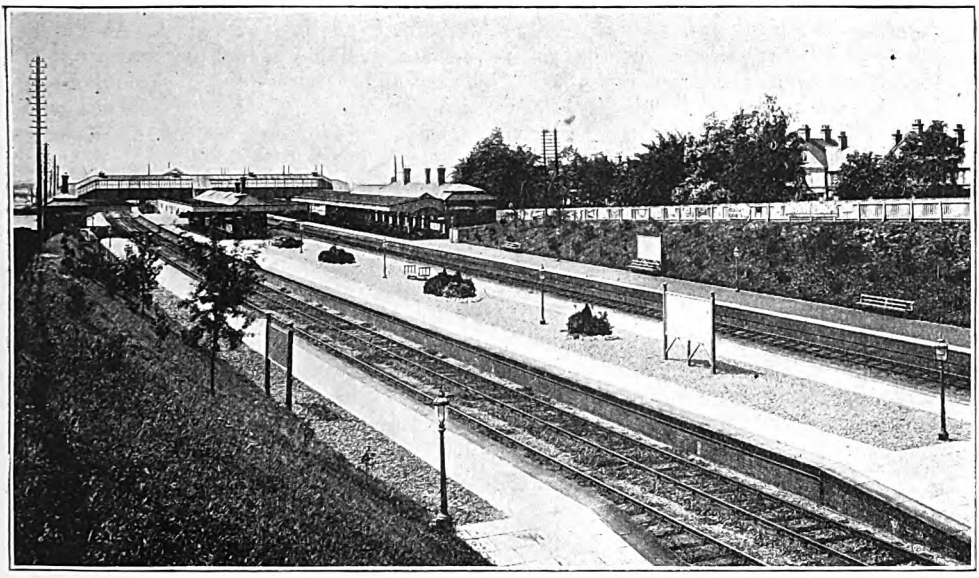

Photo] [*G.W.R.*

TWYFORD STATION, GREAT WESTERN RAILWAY.

The Railways of Berkshire.

By H. M. ALDERMAN.

OWING to its geographical position Berkshire is traversed by several great traffic arteries—railways, roads and canals, in addition to its great natural highway, the River Thames, which forms the northern boundary of the county for close on a hundred miles. The history of Berkshire is, in fact, the history of the River Thames. Pre-railway centres of population—Windsor, Maidenhead, Reading, Wallingford, Abingdon, Newbury and Hungerford — lie along its course, or that of its tributary stream, the Kennet. This, coupled with the fact that the route lent itself to easy engineering, caused the projection of the Great Western Railway to closely follow the waterways, although entailing crossing and recrossing the rivers at several places. Cuttings are few and the traveller has many peeps at delightful river scenery. Incidentally — a somewhat remarkable fact—there is not a single tunnel in the county.

The area of Berkshire, often prefixed "Royal"—by reason of Windsor and its associations—is 573,689 acres. Its highest point is Inkpen Beacon, 959 ft., on the Hampshire border, closely followed by White Horse Hill, 893 ft., on the Wiltshire side. Agriculture is the principal occupation within its boundaries, though the neighbourhood of Reading is industrial. Around Reading, the Thames valley and the eastern end of the county are residential districts, although of late years practically the whole of Berks has come to the fore in this respect; in a large measure as a result of the splendid train services provided on the principal railway routes.

Berkshire is predominantly Great Western territory. Of a total mileage of 161½ this company owns 116 miles and works a further 19¾ (part of the Didcot, Newbury and Southampton Railway). The chief lines in order of importance are :—(1) the four-track main line (from Paddington) to Didcot, continuing to Swindon, Bristol, South Wales, etc., and northward to Oxford, the Midlands and Birkenhead; and (2) the alternative main line from Reading through Newbury to Taunton, Weymouth, Exeter, Plymouth and Cornwall—*viâ* Castle Cary.

Reading, the county town, is the leading railway centre and, to use a hackneyed expression, "The Clapham Junction of Berks." It provides a "through service" route from

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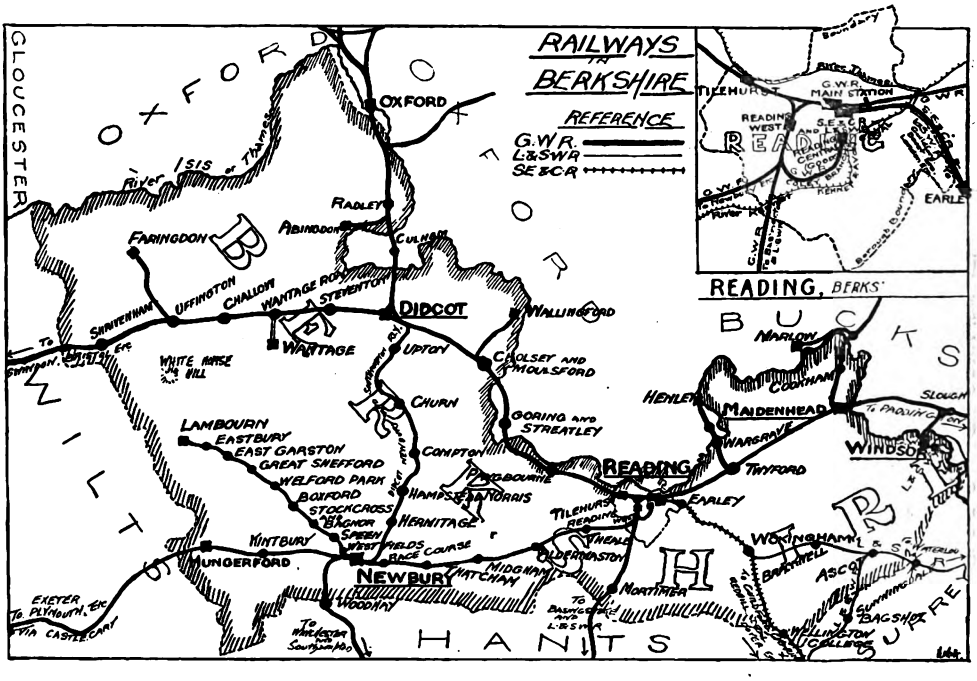
Dover and the South Eastern and Chatham Railway to the Great Western system and the Great Central Railway; likewise with Portsmouth, Southampton, Bournemouth and other places on the London and South Western Railway *viâ* Basingstoke from the Midlands and the North. A review of Reading's rail facilities appeared in the RAILWAY MAGAZINE for October, 1913, under the heading of "Reading as a Railway Centre." Other important junctions are Didcot and Newbury.

From the direction of Paddington the main line enters Berkshire by a very fine brick bridge over the Thames near Maidenhead, just under a mile on the London side of that fashionable riverside town, the nearest station for Boulter's Lock. From Maidenhead diverges the High Wycombe branch, 10 miles long, though only $4\frac{3}{8}$ miles are in Berkshire and one station—Cookham, second only to Maidenhead in the estimation of river folk. Beyond the river bridge at Bourne End the line enters "Beechy" Bucks.

Continuing along the main line is the longest-between-stations section in Berkshire—7 miles—to Twyford. One mile from the latter station the line passes through the village of Ruscombe. Here, on a site now occupied by the railway, stood a mansion (demolished when the line was made) wherein William Penn lived and died. At Twyford another riverside branch is thrown out, the Henley line, double track throughout and $4\frac{3}{4}$ miles in length, $1\frac{3}{4}$ of which are within this county, with one station, at Wargrave, a beautiful old English village. Returning to the main line just outside Twyford the track crosses the river Loddon. Between Twyford and Reading is a cutting of considerable depth and length, known as Sonning Cutting. It is the only earth work worthy of note between London and Reading. Its excavation entailed considerable difficulty and expense to the contractors, several of whom were engaged in it before the work was complete. This cutting was the scene of a landslip on December 24th, 1841, when eight lives were lost.



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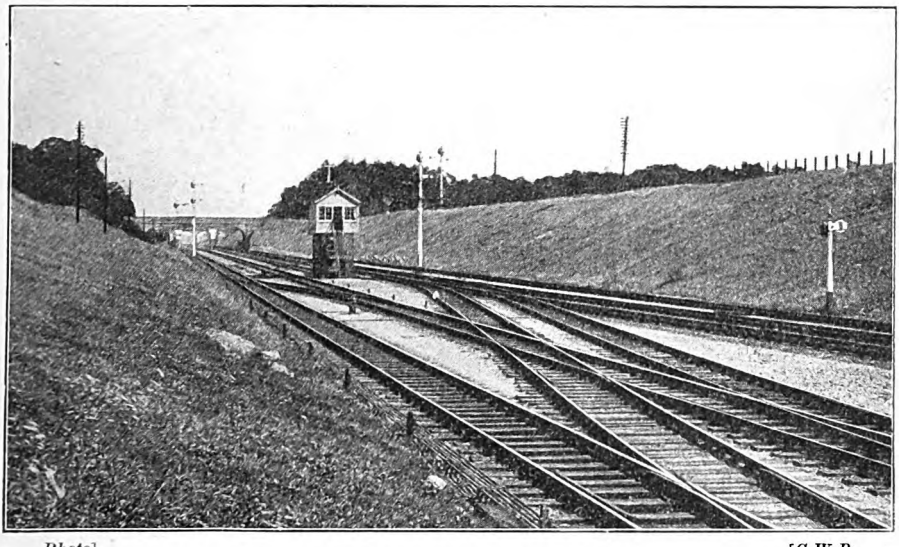
Kennet, near its confluence with the Thames, by a brick bridge parallel with that of the South Eastern and Chatham Railway, having first passed the pleasing seed trial grounds of Messrs. Sutton.

The goods lines and passenger line junctions with the South Eastern and Chatham Railway will be noticed close to the main line East Box, immediately before entering Reading station. The present passenger station was built in 1898–99 (except the frontage—this being 20 years older) and consists of six platforms and four bays, having a total length of platform face of about 6,900 ft. The longest platform, an island, comprising Nos. 4 and 5, is 1,150 ft. long by 50 ft. wide. The first station at Reading was opened for traffic on April 4th, 1840, and was a "wooden single-line station with an up platform east, a down platform west and a goods station between . . . Each passenger line crossed the other, and the goods lines crossed both." The goods station was removed about 1870 and the passenger station extended on the site. A special feature is the subway connecting all platforms. This is 100 yards long with a span of 20 ft. and 11 ft. 6 in. headway, with hydraulic lifts to each platform. North of the station are the signal engineering works of the company. All goods traffic is diverted, at the High Level Ground Frame at Scours Lane, to the goods lines, which run to the sorting sidings at the West Junction.

To the west of the station, just beyond the Caversham road bridges, is Berks and Hants Junction; here diverges the Basingstoke and Newbury line. This junction, relaid and improved in 1912 to ease the speed restriction, is controlled by the main line West Box (208 levers), the largest manually worked frame on the Great Western Railway. Continuing along the Didcot line, a mile further on is Reading West Junction. Here the west curve, some 44 chains in length, joins; this is chiefly used for goods service and special traffic, although the "through" services from the west and north, which call at Reading West station, also traverse this loop.

Tilehurst station, $2\frac{3}{4}$ miles from Reading main station, lies within the borough. The river bends southward near here, thus bringing the station and riverside into juxtaposition, a "landing" place being provided on the river bank. From here onward, through Purley Cutting, Pangbourne is reached, $5\frac{1}{2}$ miles from Reading. Goring and Streatley, the next station, $3\frac{1}{4}$ miles, is in Oxfordshire as the line crosses the Thames some two miles from Goring, re-entering Berks at Moulsford, about a mile and a quarter from Cholsey. Between Pangbourne and Goring electric power signalling is used with automatic control by track circuits (intermediate signals only) installed by the McKenzie Holland and Westinghouse Power Signal Co., Ltd. From Cholsey a short single line



Photo] [*G.W.R.*

A VIEW IN TWYFORD CUTTING.

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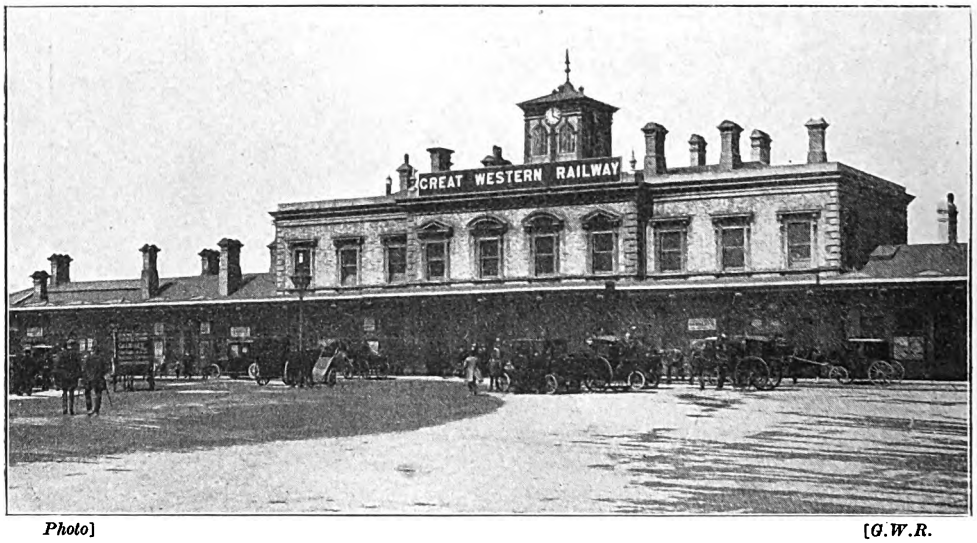
branch runs to Wallingford, one of the oldest and least changed towns on the upper reaches of the Thames. Many of the ancient earthworks surrounding the town—origin uncertain—still remain, and parts of the ancient castle are still to be seen.

Between Cholsey and Didcot, 4½ miles, the line passes through cuttings of considerable depth in the chalk hills. Didcot, a familiar name to Great Western travellers, is essentially a railway "creation." When the Great Western scheme was under consideration, as originally projected the line to Oxford and the Midlands was to have its junction at Steventon. Had that proposal been realised the crossing of the river at Appleford and recrossing at Nuneham would have been avoided, and Abingdon placed on the main line. But the powers at Abingdon, fearing the trade rivalry of Oxford, and the University authorities at Oxford, anticipating that railway facilities would lessen discipline, both petitioned against the scheme, and Didcot became the point of bifurcation. In addition to being the junction for the Swindon and Oxford lines, it is the point of departure for trains on the Didcot, Newbury and Southampton Railway.

The main platform and buildings are of the usual Great Western type, but the "up" or "Oxford" platform is a somewhat out-of-date wooden erection. There are two "loop" lines at Didcot; the first leaves the original line at the east of the station, skirts the yard and sidings, and effects a junction with the Oxford line, thereby giving a through run for fast trains, avoiding the sharp curve and the station. The other connects the Swindon line, from Foxhall Junction, with the Oxford line. These junctions are controlled by electric signalling plant and points installed by Messrs. Siemens Bros. and Co., Ltd.

Continuing along the Swindon line, near Foxhall Junction are the Great Western forage stores and mill. Here is collected and prepared forage, etc., for the company's cartage horses.

Steventon is the first station from Didcot, 3½ miles, then Wantage Road, 4 miles. We are now in "the Vale of the White Horse," King Alfred's country, Wantage itself claiming the honour of having been that King's birthplace. The "Vale" is famous as being the home of both the hero and the author of "Tom Brown's Schooldays"—every boy's favourite book—whilst to readers of Sir Walter Scott's "Kenilworth" the locality is familiar.



Photo] [*G.W.R.*

EXTERIOR OF READING STATION.

From Wantage Road a tramway connects with Wantage Town. This tramway, incorporated in 1873, opened for traffic in 1875, is 2½ miles long; there are five locomotives and three passenger vehicles.

From Wantage Road through Challow, 3½ miles, Uffington, 2½ miles, is reached, whence a branch line, 3½ miles long, turns northward to Faringdon, another old-world town and agricultural centre. It is somewhat remarkable that four of the oldest Berkshire towns—Wallingford, Abingdon, Wantage and Faringdon—should thus be linked up by

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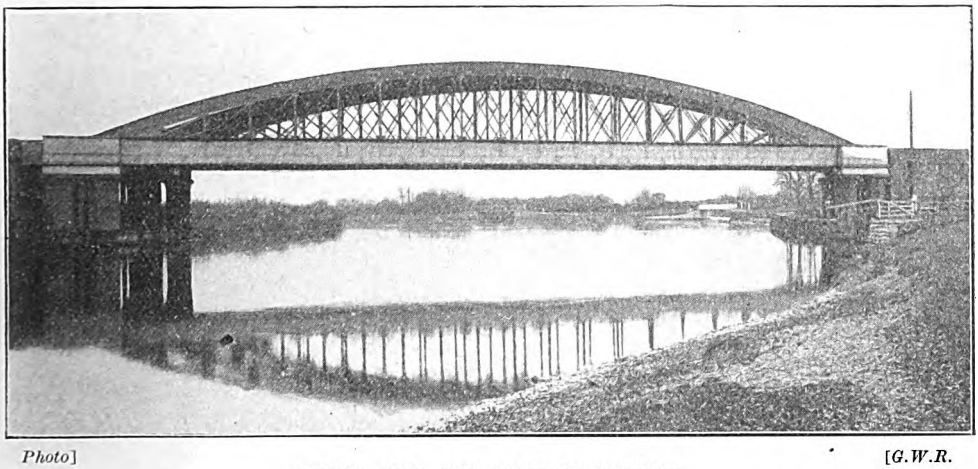
short branch lines with the main line. At Buscot Park, near Faringdon, lives Sir Alexander Henderson, Bart., M.P., Chairman of the Great Central Railway Company, and equally successful as a Berkshire farmer and breeder of the famous Buscot shire horses. One other station on the Swindon line is in Berks, Shrivenham, 5 miles from Uffington. Thence to the Wiltshire boundary, the bridge carrying the line over the River Cole, 1¼ miles, is crossed. From Reading to Didcot the line is practically level; beyond, to Shrivenham, the sharpest rise is 1 in 660.

Dealing now with the Didcot and Oxford line, from Didcot to Appleford bridge is about 2¼ miles, the line crossing the Thames again into Berkshire some 2 miles further on at Nuneham. From there to Radley is 1¼ miles. At the opening of the line, in 1844, a station was made near Nuneham Bridge, serving both Oxford and Abingdon, and was known as Oxford Road. This station was of course the outcome of the two towns' opposition to the railway; later, when Oxford had its station and Abingdon its railway, Oxford Road station was removed. From Radley runs the short branch, 2½ miles long, to Abingdon and parallel for over half a mile with the main line. This branch was made by private enterprise on the part of Abingdon people, but "worked" by the Great Western Railway up to January, 1904, the shareholders receiving very favourable terms—a fixed dividend of ten per cent. From that date the railway became Great Western freehold property, the shareholders being bought out at nearly three times the par value of their shares. Since that time the line has been improved, and a new station erected at Abingdon, part of the old buildings (timber and iron) being removed to the Reading Permanent Way Depôt and re-erected as a store. From Radley to Hinksey, where the line crosses to Oxfordshire, is about 3½ miles. Between the two are Kennington Junction, where the High Wycombe branch *viâ* Princes Risborough joins, and "Halts" at Iffley, Abingdon Road, and Hinksey, these "halts" being served principally by the Princes Risborough–Oxford trains and motors.

The Berks and Hants line, now a part of the direct main route to Plymouth, commences 200 yards west of Reading (main) station at the junction previously mentioned. In ¾ of a mile Reading West station (passenger traffic only) is reached. This station was opened for traffic in 1905. The West Curve—the loop line from the direction of Tilehurst—here joins up, the junction being controlled by the Oxford Road Cabin.



Photo] [*G.W.R.*

BRIDGE OVER THE RIVER AT WINDSOR.

A further ¾ of a mile along is Southcote Junction, where the Coley branch is thrown off on the left, and a short distance beyond the Newbury and Basingstoke lines separate. The Coley branch, some 1¾ miles long, is a goods line only and was constructed a few years ago with a yard and warehouses at its terminal, known as Reading Central (Goods).

As far as the Basingstoke branch, 6¾ miles, is concerned, only one station, Mortimer, is in Berkshire. Just over the Hampshire borders are Silchester (Roman remains) and Stratfield Saye House, the seat of the Duke of Wellington.

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From Southcote along the Berks and Hants line, which through Berkshire and for some distance beyond closely follows the River Kennet and the Kennet and Avon Canal, the latter being the property of the Great Western Railway, there are stations at Theale, Aldermaston, Midgham—water troughs between these last two—Thatcham and Newbury, 17 miles from Reading. Newbury, as remarked previously in this article, is a busy traffic centre. Here the Didcot and Southampton Railway joins up and the Lambourn branch has its terminus.

The present station, which is quite modern and convenient, was built in 1908–9 and has "up" and "down" platforms of considerable length, of the usual covered Great Western type, with a bay at the west of each.

Photo] [*G.W.R.*

NEWBURY RACECOURSE STATION.

Newbury Racecourse station is about one mile distant towards Thatcham; it possesses ample platform accommodation and siding room for dealing with the large volume of traffic in connection with these popular "meetings."

The town of Newbury can never be classed as "sleepy"; it is, indeed, quite a busy place and an important marketing centre.

The Lambourn valley light railway, as its older name implies, is a "surface track" following the course of the river Lambourn and linking up the village of the same name with Newbury. It is 12½ miles in length, single line throughout, with seven intermediate stations and one halt, the latter at Newbury—West Fields. Previously a private concern, the line has been absorbed into the Great Western system and is now worked by motor train—one class only.

On from Newbury along the main line at Enborne Junction the Didcot, Newbury and Southampton Railway turns southwards. Kintbury, the first station on the main route, is followed by Hungerford, 8½ miles in all from its neighbour, Newbury. There is nothing of especial note in the station—the town itself is very quaint and known to all good anglers for its excellent trout fishing. The only modern thing about Hungerford would appear to be the iron lattice girder bridge carrying the railway over the picturesque High Street. About 2½ miles from Hungerford, towards Bedwyn, the line crosses to Wilts, not far from Littlecote Hall.

The only remaining length of Great Western line within Berkshire to be mentioned is the Slough and Windsor branch, about half a mile of which and the station lie within the Royal Borough of Windsor.

It is now necessary to consider the Didcot, Newbury and Southampton Railway. Its territorial title indicates its field of operation, although it is essentially a cross-country railway linking up the Midlands with the southern seaboard. 19¾ miles out of a total of 44¾ miles are within the Royal County.

Worked as two sections or divisions, Didcot–Newbury and Newbury–Winchester, the first mentioned was opened in 1882 and leased to the Great Western in the same year. The latter, opened for traffic in 1885, had been previously leased to the Great Western Railway, August 14th, 1884. Between

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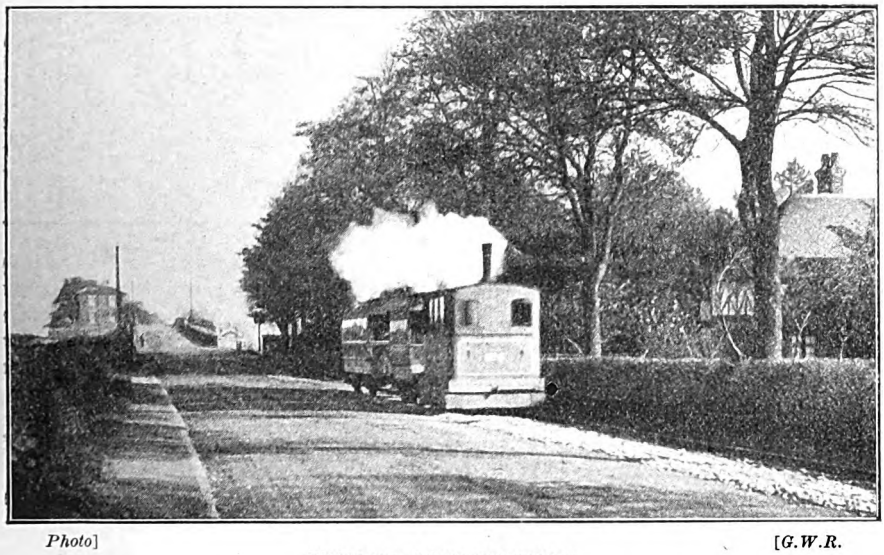
Didcot and Newbury, 17½ miles, the line winds its way along the valleys of the "Down" country, a tract of Berkshire bounded by the Lambourn valley on the west, that is largely given over to the training of racehorses—thanks no doubt to the wonderful "going" obtained on the short springy turf of the Downs. The stations on this section are Upton and Blewbury, Churn, Compton, Hampstead Norris, and Hermitage. It joins the Great Western main line near the gasworks, about ½ mile from Newbury station. Between junctions the line is single, with "up" and "down" roads at stations. Of the Winchester section about 2¼ miles, from Enborne Junction to Woodhay, just over the Hampshire borders, are within Berks.

Eastern and Chatham Railway with the trunk routes of the Great Western. The branch enters upon Berkshire soil near Blackwater and Camberley station, at the point where it crosses the River Blackwater. In 2¾ miles Wellington College station is reached, its name being derived from the great public school founded in 1853, under Queen Victoria's patronage, as a national memorial of the "Great Duke of Wellington." Situated between the forementioned stations is Sandhurst halt, opened a few years ago to provide extra facilities for the increasing residential traffic. From Wellington College to Wokingham is 3¾ miles, the latter a market town, old, but with no history of remark. Just before entering the station the London and South Western



Photo] [*G.W.R.*

WANTAGE ROAD TRAMWAY.

Maintenance of the permanent way of Great Western lines in Berkshire comes under the authority of the Paddington Divisional Engineer, with the exception of that part of the Berks and Hants west of Enborne Junction, and the section west of Foxhall Junction, Didcot, which is included in the Bristol Division.

Twelve and a quarter miles of the Redhill and Reading branch is the South Eastern and Chatham Railway's share of the Berkshire railway mileage. This line, formerly the Reading, Guildford and Reigate Railway, afterwards absorbed into the South Eastern Railway system, was opened for traffic in 1848. It now ranks as a secondary main line, joining up the principal lines of the South

Staines and Reading line joins up. From Wokingham the track passes under Skew Bridge, the only engineering feature so far worthy of note, a brick erection with pierced intermediate piers carrying the Wokingham-Reading road over the railway at an acute angle. Next is passed Sindlesham and Hurst halt, then Earley, 4 miles, the "ticket" station for Reading and close to the borough boundary. From Earley the line forms the town's eastern boundary as far as the Kennet. This river it crosses by a brick arch. Passing the gasworks and Messrs. Huntley and Palmer's premises on the left with siding connections with each, through the goods yard, the line ascends a steep bank and crosses the Vastern Road by a girder

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bridge and enters the Reading station used jointly by South Eastern and Chatham and London and South Western trains, the latter by virtue of running powers from Wokingham.

The Berkshire mileage of the London and South Western Railway is approximately equal to that of the South Eastern and Chatham Railway and forms part of the Staines, Wokingham and Reading branch. This line brings Reading within 43½ miles of Waterloo, as compared with 36 miles by Great Western Railway to Paddington and 68¾ by South Eastern Railway to Charing Cross.

This branch line serves the "outer-suburban" residential district of East Berks—sometimes known as the Windsor Forest district—and further fills an important place in London and South Western Railway traffic working as an "exchange" line with the Great Western *viâ* Reading.

Entering from Surrey, near Sunningdale, the first Berkshire station, 2 miles, is Ascot, and once during the year—Ascot race week—one of the busiest stations on the South Western system. At Ascot the Bagshot-Camberley branch joins, 2 miles of which are in the Royal County; from Ascot in about a mile the racecourse platforms are passed, and known as Ascot West. From thence to Bracknell, a further 2½ miles, where large quantities of brick traffic are dealt with, then to Wokingham Junction, 4¼ miles, where the South Eastern Company's railroad is joined.

It may here be noted that the London and South Western Railway Company are the owners of about 30 chains of sidings, joining the South Eastern and Chatham Railway goods yard at Reading, and connected with the yard of the Great Western Railway. These sidings are used for transferring goods traffic with the latter company.

There remains one other length of South Western line in Berks to be mentioned: the terminal station at Windsor and about ¾ of a mile of the Windsor branch up to the Thames, where it crosses into Bucks.

The following table will be of interest:—

TRAIN SERVICE: QUICKEST TIMES BETWEEN LONDON AND BERKSHIRE TOWNS.

From	To	Miles from London.	Quickest journey time either direction.
Paddington	Windsor ..	21¼	32 min.
Waterloo ..	,, ..	25¾	45 ,,
Paddington	Maidenhead ..	24¼	30 ,,
,, ..	Reading ..	36	40 ,,
Waterloo ..	,, ..	43½	79 ,,
Paddington	Wallingford ..	51¼	92 ,,
,, ..	Didcot ..	53	59 ,,
,, ..	Newbury ..	53	68 ,,
,, ..	Wantage (Rd.)	60½	85 ,,
,, ..	Abingdon ..	61	91 ,,
,, ..	Hungerford ..	61½	82 ,,
Waterloo ..	Wokingham ..	36¾	64 ,,

This brief description of the county railways would not be complete unless mention was made of the goods lines and sidings at Messrs. Huntley and Palmer's biscuit works at Reading. These private sidings are connected with the lines of the three great companies dealt with in the course of this article. They have a total length of over three miles, with 50 switches and crossings. Traffic on them is operated by means of four privately owned tank engines.

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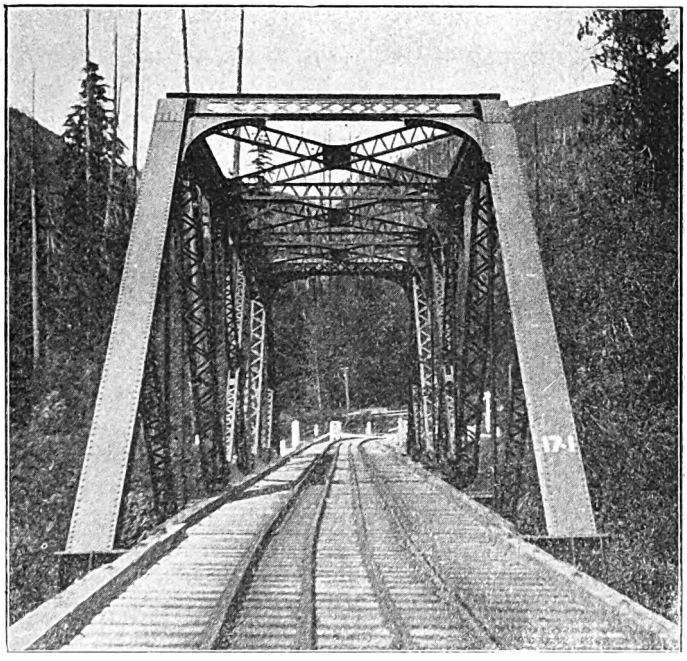
The Esquimalt and Nanaimo Railway.

By

NORMAN THOMPSON



GIRDER BRIDGE NEAR COWICHAN LAKE.

IN the RAILWAY MAGAZINE for January, 1915, an article dealing with this railway was published; but there have been notable developments recently, and in view of the importance which this line is now realising, as well as the interest it possesses in several ways, a further article will no doubt be acceptable to readers, especially as it is of a comprehensive character and of wider scope than that previously published.

Originally constructed by Robert Dunsmuir and opened in 1886, the "E. & N.," as it is popularly known, has since come under the control of the Canadian Pacific Railway, by whom considerable extensions have been carried out, with a correspondingly enlarged scope for its activities. Consequent on the transference of the ocean shipping to Victoria the one-time glories of Esquimalt have departed, and the name only appears in the time-tables as a flag station *en route* to the capital city, whilst the coal city of Nanaimo relies on water carriage for the transportation of its most important product.

At the moment of writing the "E. & N." has at present no competitors in actual operation, although each of the rival transcontinental roads has a line either graded or projected through its territory. A comprehensive scheme for new joint terminals at Victoria has been drawn up, and as the existing depôt at Store Street is unlikely to survive the march of progress much longer, it will be interesting to note the methods of working now employed, especially as they include some unusual features.

Access to the station is gained by the railway over an opening girder bridge spanning an arm of the harbour, and as this structure is unable to take the large locomotives now in use on the main line, the "road" engines are attached and detached at or near Russell's, where the roundhouse, shops and car tracks are located.

Trains are hauled "out" and "pushed into" the passenger terminal by one or other of two 2–4–2 tank engines, built in Montreal, and they also perform the switching at the freight yard. The station is a red brick building of neat design, looking out on Chinatown, and the track passes into the thoroughfare and continues along the latter to the Chatham Street yard, the little engine with its load of "box" or "flat" cars appearing to be quite at home amongst the ordinary traffic of the street on the occasions of its two daily trips.

Many points of interest and a wealth of beautiful scenery are disclosed by a run up the island, and it will be worth while, therefore, to follow the morning train from

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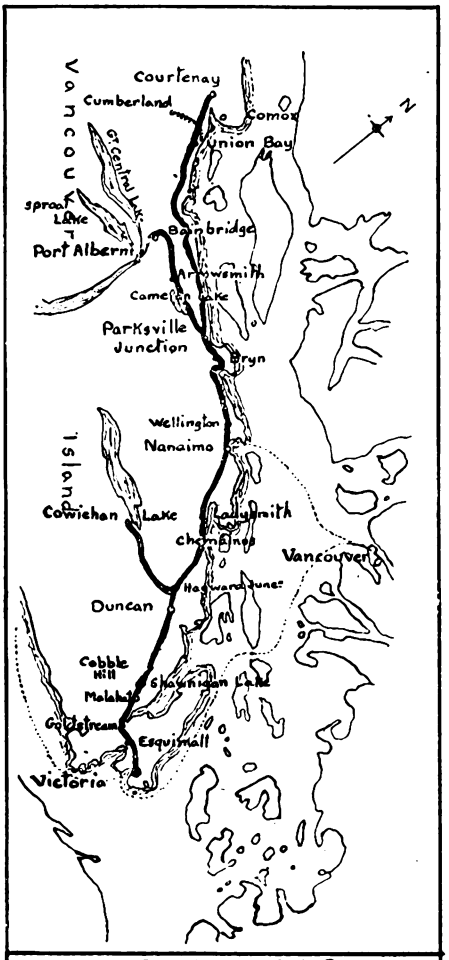

SKETCH PLAN OF E.&N. RAILWAY.

Victoria on its Northward course. It is designated number 1 or 3 on alternate days, according to the destination after Parksville Junction, the point of bifurcation, has been reached. This is situated at a distance of 95 miles, and the train then either continues parallel to the East Coast as far as the temporary terminal at Courtenay, 44½ miles further, or traverses a region of mountain and lake to the head of the Alberni Canal, a natural inlet of the West Coast.

As usually made up the local consists of five cars, in order from the engine, consisting of mail, baggage, passenger, first class and parlour cars. These are lettered either "Esquimalt and Nanaimo Railway," or "Canadian Pacific," and a note is sometimes to be observed on the rolling stock, indicating that it is owned by the latter or leased to the former. The departure is timed for 9.0 a.m., and after crossing the Victoria Arm, the line traverses the late Songhees Indian reserve, and at one mile Russell's is reached where the Canadian Pacific engine backs on. Getting away from here, the Esquimalt Road is crossed on the level, and there follows a comprehensive view of the many homes of the Victoria West district.

Wooded country is then encountered, with outcroppings of lichen-covered rock, and several charming glimpses of Esquimalt Harbour on the left, and perchance a group of Indians gazing curiously at the train from their tree-environed haunts. At Palmer the grade of the Canadian Northern Pacific Railway is crossed, the girders for the "E. & N." permanent bridge having but recently been lowered into position, and the first regular stop occurs at Colwood, 8 miles out from the city. After Goldstream, the next station, the railway enters on a section of great interest, clinging to the mountain side far above the celebrated Malahat Drive, which can be seen from time to time winding, a white ribbon, along the cliff, with the placid water of the beautiful Saanich Inlet in the gorge at a still lower level.

Two cross ravines are encountered, each of which has been responsible for the erection of an imposing steel viaduct on concrete foundations. The first of these is known as "Niagara," and lower down the water pours over a perpendicular ledge of quite a respectable height. From the observation platform that has been placed at the foot there is no sign of the railway viaduct above, which will afford some idea of the large scale on which nature works in these parts. A military guard has been provided for both these structures, the men living in tents squeezed in between the track and the rocky wall out of which the road bed has been carved, whilst an old railway car serves as a dining hall. There is a short tunnel through the rock on this section, the sole specimen to be encountered on the whole journey, and the wild nature of the country is indicated by the somewhat unimaginative appellations of stopping places as "17-mile post," "25-mile post," and "Summit" (renamed Malahat). At Wilby there is a passing loop where No. 7 is side-tracked for the evening train into Victoria, and near here the lower end of Shawnigan Lake is sighted, with numbers of logs floating by the shore.

This stretch of water is much resorted to in the summer and two hotels have been

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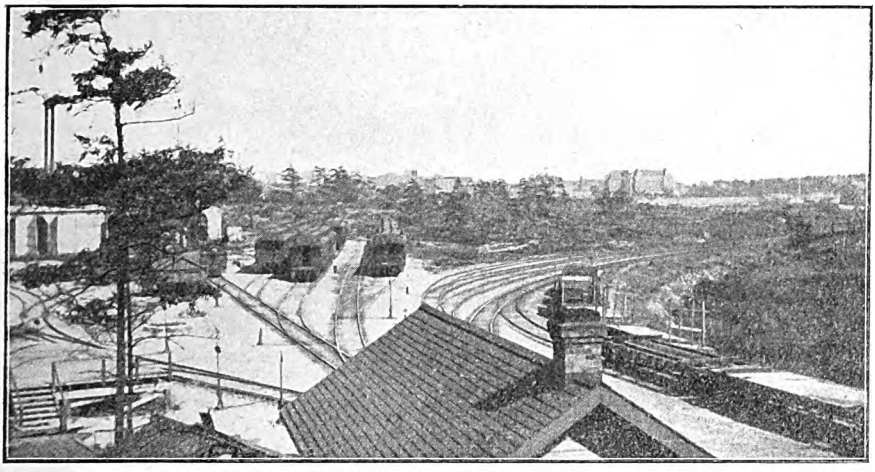

ENGINE SHEDS, WORKSHOPS AND SIDINGS AT RUSSELL'S.

established, at both of which calls are made. The "Strathcona Lodge" is the first one reached, being connected directly with the station platform. Turning sharply to the left, the train descends a steep grade to the water level and halts for a moment at Koenig's, at the far end of the lake. At the next station, Cobble Hill, there is another passing track, on which No. 8 passenger South-bound, and a freight North-bound may be seen at times standing head on.

The mountains on the left, usually surmounted by a curious reddish haze, now withdraw, and the small community of Cowichan appears. Continuing for several miles and crossing two girder bridges spanning the Kohsilah River, the town of Duncan is reached, being almost 40 miles from Victoria. This is a business and distributing centre for surrounding mines and lumber camps, situated on the Cowichan River at the foot of Mount Prevost, and within a mile or two of Somenos and Quamichan Lakes.

It is also the transfer point for the branch railway to Cowichan Lake, which diverges from the main line 1¾ miles beyond and runs through the bush for about 18 miles. The local train disturbs the solitude of Sahtlam and Cowichan Lake districts on Wednesdays and Saturdays only, and is made up after the departure of the main line train, a 4-6-0 type engine materialising suddenly from nowhere in particular, and going through a lengthy process of shunting, finally presenting the following result of its labours at the platform: next the engine a Canadian Pacific box car, followed by a freight caboose to which is attached a combined mail and baggage car, with two passenger cars in the rear. The latter have

TRAIN NO. 3 LEAVING VICTORIA, B.C.

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not a very prepossessing appearance externally, but are comfortable enough inside. A stove is carried in one corner for heating purposes.

On the return trip the branch train takes the Northern curve at Hayward Junction, backing thence all the way to Duncan, being thus headed right for its next trip. The trainmen attend to the switches, four stops being thus necessitated in negotiating the junction.

It is, however, time to overtake in imagination No. 3, which has been steadily covering an average of 20 miles an hour on its Northward course. Soon after leaving Duncan, Mount Sicker, from which copper, gold and silver ores have been obtained, appears on the left and continues in sight for some distance. There was formerly a stopping place here, but it has vanished from the schedule since the closing of the smelting works at Crofton some years ago. Another girder bridge leads on to Chemainus, where there is a lumber mill said to be capable of dealing with 500,000 feet of lumber per diem. A logging railway effects a diamond crossing with the main line near here.

The next place of interest is the shipping port of Ladysmith, many of whose streets commemorate names rendered famous in South Africa. The population reaches 3,300, quite a respectable figure for these parts, and the industries include a copper smelter, sawmill and iron foundry. There is a good harbour, with excellent dockage facilities, and the Canadian Pacific Railway have established a car ferry to and from the mainland, by means of which freight cars from several remote systems find their way on to the island. One might reasonably expect to meet with specimens of the rolling stock of the Minneapolis, St. Paul and Soo Ste Marie Railway, or the Grand Trunk, but it seems a far cry to the distant regions served by the Louisville and Nashville and Illinois Central lines. A flat car of the Temiskaming and Northern Ontario Railway has also been noticed on the "E. & N."

At Ladysmith one may see a sight not at all familiar in the West, of coal trucks loaded with "black diamonds," also a passenger car of forbidding appearance belonging to the Wellington Colliery Company, for this is the centre of the Newcastle mining district.

ARRIVAL OF TRAIN NO. 3 AT DUNCAN.

The station is a two-storey wooden building, painted maroon and boasts a fine garden, the general effect reminding one slightly of the Grand Trunk depôt at Hamilton, Ontario. The sign "Sun Wah and Co." appears prominently on a building near by, and Chinamen frequently make use of the trains, especially in the neighbourhood of Victoria where they engage extensively in market gardening, while it is by no means uncommon to notice a bearded sikh, garbed in European fashion, except of course for the turban.

Starting away once more, another bridge is crossed, and the first overbridge

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A VIEW ON THE COWICHAN LAKE BRANCH.

encountered, followed by another diamond crossing, and a reach of dismal stump land is traversed to South Wellington, a colliery hamlet, and Nanaimo, the half way point on the journey, and the next most important centre after Victoria.

The mines here have been operated since 1850, and when fully working employ a large number of men. The port enjoys excellent steamship communication with both the mainland and island points, being served by the vessels of both the Canadian Pacific and Union Steamship Companies. The *Princess Patricia*, the fastest boat on the coast, steams across to Vancouver in about two hours every week-day throughout the year, and twice daily during the summer, and there is a 'bus connection from the railway station to the wharf. Then the *Charmer* makes two trips a week to Comox, calling also at Union Bay.

Beyond the station a high gravel embankment occurs, and leaving the town behind, Northfield is soon passed and Wellington reached, where the evening train from Victoria completes its trip, returning the following morning. This is, however, a place of no visible importance, and one is glad to resume progress down the glade and along Nanoose Bay to Bryn, where there is a brief stop to cross No. 2 going South from Courtenay.

At 14.08 Parksville Junction should be reached, where an allowance of twenty minutes is made for lunch. Taking the left branch the run for the first 12 miles is not particularly interesting, until with unexpected suddenness the exquisite picture of Cameron Lake bursts upon the view, whilst the train halts for an instant at the station The Canadian Pacific Railway has built a Chalet here that is open throughout the year. The railway now follows the shore of the lake for miles, occupying a ledge cut out of the precipitous heights that shut in the water on both sides, and then taking a sharp bend to the south-west proceeds to round the base of Mount Arrowsmith, whose summit is clothed with eternal snow. On this section innumerable trestles are crossed and two of these are of exceptional height and on a curve as well. In the deepest part there are five tiers of "bents," and in one case an excellent view can be obtained from the car window previous to reaching the structure.

A curious accompaniment to the passage of the train along the many steep embankments and cuttings is the clatter of miniature avalanches of pebbles as they roll down the slopes. The scenery between Cameron Lake station and Bainbridge—a stretch of 19 miles—can only be described as remarkable, and still capable of impressing one with its grandeur even after the experience of a trip through the "Rockies." The summit of the line in this region is 1,600 ft. above sea-level, a height that is both climbed and descended in 1¼ hours on the Western side. As the valley widens out the display of growing timber is astonishing, both in regard to size and extent, and this forms a fitting conclusion to the run, for after calling at Alberni (Old Town) a couple of miles brings the end of the journey, Port Alberni, which is reached at 16.30, the same engine and train crew having come right through from Victoria.

Port Alberni is rightly described as a "townsite," being in a state of transition from its natural condition to that of a modern town. On paper a dozen avenues laid out with distressing regularity rise in succession from the water in parallel ridges along the slope of the ground, but the

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actuality cannot be described as pleasing at the present stage. Stumps, isolated houses, stumps, a fine post office and customs building, more stumps, some stores, and a "hard line" of standing timber where the work of destruction has ceased with mathematical precision.

Down by the water there are the passenger depôt, freight house, a group of hotels and the wharf. The Somas Hotel, just opposite the depôt, is a commodious and comfortable house, convenient for visiting Great Central Lake, Sproat Lake, called the Lucerne of Vancouver Island, and other places of interest. The Strathcona Park reserve will also soon be accessible from Alberni by road. Port Alberni is imbued with the idea that some day it may become a great port for trade with the Orient by virtue of its position, where the Somas River flows into Stamp Harbour, which is connected through the Alberni natural canal with Barclay Sound and the open Pacific.

The little steamship *Tees* puts in an appearance about once a week on its trip up the West Coast from Victoria, but otherwise, except for a few motor boats, the still waters are untroubled by any craft of commerce. The track extends for a considerable distance beyond the station to serve the lumber industry, which has attained considerable proportions in times past.

As in the sunset hour one looks upon the silent scene, a lone box car standing outside the closed freight house seems to emphasise the stillness, and there steals over one that sense of dignified melancholy that seems to brood over railway termini situated in remote spots with a mountain setting. For a moment a vision of the most Westerly terminus in Europe comes to the mind's eye, but the charm of Alberni is not as the charm of Valencia Harbour. The colours of the sunset sky fade one into another, and the water takes on a tint of pink as the amphitheatre of mountains recedes into the coming darkness, and the tiny electric bulbs that light the two towns begin to twinkle brightly.

Next morning at 11.0 a.m. the train commences its return journey, and one can alight at Parksville Junction, and wait for No. 1 which has been running in the same time as No. 3 so far, but now pursues the main line past Qualicum Beach (where there are a modern hotel and golf course and three miles of sands) and Union Bay to Courtenay, 140 miles from Victoria. Union Bay is the shipping point for the product of the Cumberland mines, and a separately owned railway reaches the town of that name, a place of more than 1,000 inhabitants. A daily passenger train is run, and a first-class car has recently been built locally in the shops at Union Bay, for service on that line.

This completes a brief survey of the "E. & N." system as at present existing, and reference may now be made to some features of general application before concluding. The stations frequently carry their names on the roof in the accepted Canadian fashion, but sometimes a board slung under the eaves is employed, and in not a few instances no attempt appears to have been made to display this information visibly, but of course each stopping place is announced by the trainman passing through the cars before the arrival thereat, and boards are invariably provided at the distance of one mile from each station in both directions on which the name is inscribed. Switch warnings are given by a white board carrying two solid black circles placed longitudinally; "yard limit"

A VIEW ON THE MAIN LINE NEAR FITZGERALD'S.

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signs are painted a brownish-yellow colour, mile posts are placed diagonally showing faces in either direction.

A mechanical form of steel scotch working in connection with a ground disc is in use on the passing loops; it lifts up and back from the rail when the disc shows "clear." Chinese are employed as section-men for ballasting, etc. Owing to the rocky nature of much of the ground, fence and other posts are often supported by cairns of stones heaped round them, and in many cases the luxurious growth of bracken has completely submerged the fencing, rendering it quite invisible.

In addition to the regular train service "specials" are run on public holidays from Victoria to Cowichan Lake, and cheap return fares are granted at such times between all stations. Regattas, fruit and flower shows, etc., at Shawnigan Lake sometimes also induce the running of a "special."

An attenuated time-table folder is in existence, garbed in modest black and white in contrast to its highly coloured companions of other railways; the front page displays the "E. & N." Railway's device, a moose with mountain peaks in the background, on a shield something after the Canadian Pacific style, and the note "Trains run on Pacific standard time." The inside pages contain the actual schedules, the stations being printed separately for Northbound and Southbound trains, contrary to the more general American practice which necessitates reading up one side of a central column, usually the right hand. The train columns are all headed "passenger" with the number and the days of the week on which they run. There is an entire absence of general information and advertising matter, and the 24-hour notation is employed. An excellent map is to be found on the back cover, showing the island as far North as Campbell River.

A number of changes in the location of stopping places as well as alterations in station nomenclature have taken place from time to time, and the following table shows the contrast between 1911 and 1915 in these respects, apart of course from the opening of additional sections of line.

Formerly.	Mileage from Victoria.	Now.
Stewart's	4.6	
	5.1	Palmer
Parson's Bridge ..	5.7	
Summit	20.0	Malahat
Duncan's	39.7	Duncan
Mount Sicker ..	46.2	
Olsen's	54.5	Saltair
Stark's Crossing ..	69.2	Stark's
Nanoose Bay ..	86.8	Nanoose
McBride Junction	95.2	Parksville Junction

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Splashers.

By THEODORE HORN.

TO lovers of the locomotive it is often interesting to trace or compare the various developments of small points of detail, internal or external, which may have no direct bearing on the working of the locomotive, and yet help in no small degree to make up its individuality. It is, indeed, a fascinating task to put together the various ways in which provision has been made for the many small parts which go to make up a locomotive in all its wonderful completeness, often. in fact, adding that touch which transforms a mere machine into a thing of life. Of the more conspicuous external features whose history and development seem worth recording are splashers.

There has been a most remarkable tendency in British locomotive design from its earliest days to keep the footplate or running-board low, usually 4 ft. or 4 ft. 3 in. from rail level. Any wheel, therefore, of a larger diameter than that has inevitably projected above the footplate, and it is the shield or covering which is fitted over any such wheel which is known as a splasher. The object of the splasher is probably indicated by its name, that is, to collect any dust or dirt thrown up by the wheel: but it may be that an additional reason is to be found in a desire to protect the enginemen from any injury the wheel might inflict. It may be noted that on many older locomotives small bogie or carrying wheels are provided with splashers, *e.g.*, the Great Western standard outside-framed bogie, and the leading wheels on the London and North Western "Lady of the Lake" class. Such a provision would be valuable in protecting the cylinders and motion from dust and dirt.

It would appear that splashers existed as far back as the 'thirties. In their most primitive form they are found on the Great Western *North Star* of 1837, that is, a slender shield covering only the tyre and tread of the wheel, with a slight ornamental beading. The *North Star* is typical of a long British tradition, in that both leading and trailing wheels are slightly higher than the footplate, and are therefore covered by a diminutive splasher. This feature is very noticeable on many classes of 2-4-0 locomotives, *e.g.*, on the Great Northern and North Eastern engines of that type.

Given the general need for the splasher it is open to the designer of the locomotive to indulge his fancy or his individuality in supplying that need. Accordingly we at once find diversity of design and ornamentation: for example, the provision of large side-sheets with two or more ornamental openings, as in the case of McConnell's "Bloomers" on the North Western, Stirling's 8 ft. singles on the Great Northern, and many others. Again, it is now usual to fit the name-plate (if the engine bears a name) on the top or side of the splasher, instead of on the boiler.

The use of outside cylinders and large coupled wheels brings complications. It is obvious that, with large coupled driving wheels or outside cylinders, coupling and connecting rods will project above the footplate, and if everything so projecting is to be covered, how is this new need to be supplied? Actual examples show that standard practice may roughly be divided into three methods. The designer of the locomotive can, first, fit the usual wheel splasher along with a small wide splasher to cover the throw of the coupling or connecting rod: a good example of this method is the standard North Western practice. It is interesting to note that in late years there has been a tendency to use this type of splasher increasingly; see, for example, the latest Great Central engines, and compare the earlier and later "Atlantics" and 4-6-0's on the North Eastern.

In the second case, the splasher may be made wide enough to cover both wheel and coupling rod. This has always been a favourite pattern of splasher, and when, as often, a pair are arranged with a small reverse curve in the small connecting piece, so that the lines are continuous, and finished off with bright brass beading and the company's coat of arms, the effect is exceedingly pleasing. Examples of this may

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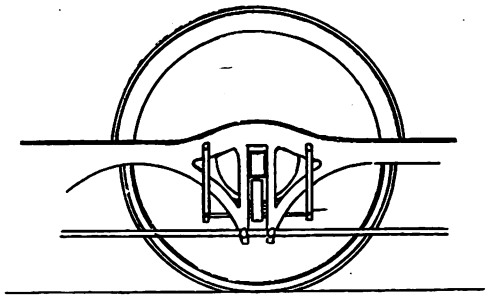

FIG. 1. *North Star*, GREAT WESTERN RAILWAY (BROAD GAUGE, 1837).

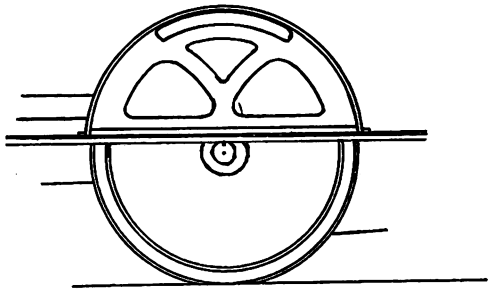

FIG. 2. MR. MCCONNELL'S "BLOOMER" CLASS, LONDON AND NORTH WESTERN RAILWAY.

be seen on many Midland engines of a decade or two ago, and the Lancashire and Yorkshire "Atlantics" and 4–4–0's.

The third method is to raise the running board sufficiently high to clear all coupling rods. In this category would come most outside framed locomotives which have outside cranks, a design which has been highly developed on the Great Western, *e.g.*, on the "City" and "Flower" classes. This is in many ways the simplest method of all. It was used probably at the first for single drivers with outside cylinders, *e.g.*, "Lady of the Lake," but has since been very largely used on all classes of locomotives; it is characteristic of Great Northern practice.

These generalizations must, of course, be qualified in certain cases. They will only apply when the driving wheels are fairly large, say 5 ft. 8 in. and over. In the case of goods locomotives, the wheels as a rule being small, only small and unpretentious splashers are needed; on tank engines, again, any simple splasher fitted is usually concealed from view by the tank.

It is often found desirable to fit a triangular sandbox to the front of the splasher; certain goods engines on the Great Northern have one splasher with sandbox front and back. The practice of fitting one continuous splasher has the same advantage, *viz.*, that a sandbox can be fitted between the wheels. On the North Eastern the continuous splasher fitted to many Worsdell locomotives contains the Westinghouse brake pump.

The case of the locomotive with a coupled wheel behind the firebox has in many cases produced what appears to be a large rectangular splasher, but as a rule this is caused by the side sheet of the splasher being continued upwards to form the cab, the wheel being encased in a smaller and lower covering, which in some cases provides a seat for the driver. Again, in locomotives of this wheel arrangement the rear splasher sometimes disappears behind the cab side sheets, sometimes it is built into the cab side sheet, still preserving its identity. An interesting combination is to be seen on that most graceful North Eastern rebuild No. 933 (901 class), where the front coupled wheel is covered by a narrow circular splasher with a small coupling rod splasher, while the rear coupled wheel has a wide splasher built into the cab. In connection with this may be mentioned the North Eastern practice of fitting outside cylinder engines with a long low splasher to cover the coupling and connecting rods, reaching from the smoke-box to the cab. This is noticeable on all North Eastern "Atlantics," but especially

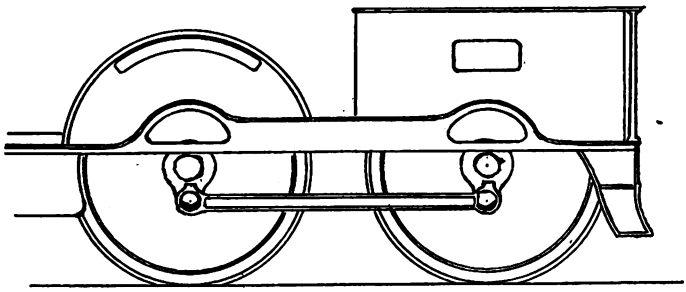

FIG. 3. "PRECEDENT" CLASS, LONDON AND NORTH WESTERN RAILWAY.

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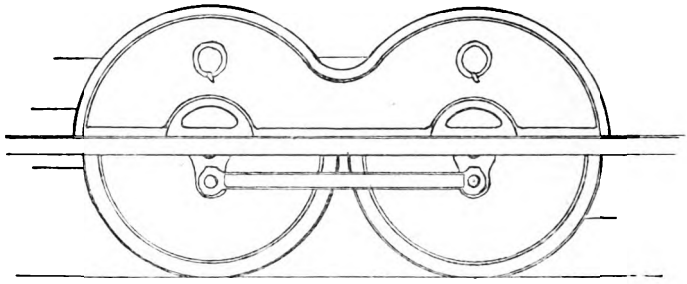

FIG. 4. 1400 CLASS, LANCASHIRE AND YORKSHIRE RAILWAY.

on the compounds Nos. 730 and 731, to which this feature imparts a remarkable appearance.

It would be, of course, impossible to select any single design of splasher as ideal; each pattern has its use and looks well under suitable conditions. But it may not be invidious to point out two standard designs developed by two great railways. On the North Western in 1874 Mr. F. W. Webb brought out his "Precedent" class of 2–4–0 locomotives. These were fitted with splashers of a design which has remained essentially unaltered to the present day—a small coupling rod splasher, a circular splasher over the driving wheel, on which is placed the usual brass name plate and the company's coat of arms, and a large rectangular splasher beneath the cab and bearing the number plate. There have, of course, been modifications: the three-cylinder compounds had four openings in the coupling rod splasher instead of two, the four-cylinder compounds and the "Precursors" reverted to the original type, the "Experiments" introduced a long continuous splasher, and had no openings in the coupling rod splashers. The "George the Fifths" were fitted with a continuous splasher containing a sandbox (some of them now have a small triangular sandbox at the front of the splasher) and finally, on the "Claughtons" the coupling rod splasher is extended forward to cover the cylinders and motion. But apart from these necessary modifications the type has remained essentially the same.

The North Eastern locomotives of the original class D (2–4–0), built by Mr. T. W. Worsdell in 1886, are usually remembered as being the first North Eastern compounds, and the first North Eastern engines to be fitted with the large cab with side windows, now the standard pattern on that railway. But it is here to the point to note that they also had splashers of a design new to that railway. Historically, indeed, this type of splasher was first introduced by Mr. Worsdell on his last locomotives on the Great Eastern built a year or two previously, but the type was not perpetuated there. On the North Eastern, however, the design, which consisted of a wide continuous splasher covering both driving wheels as well as the coupling rods, remained standard for many years. In 1899, however, the locomotives of Class R had the driving wheels separately marked out by brass beading, and since then the design has not been used. While it lasted, very few patterns of splasher have looked so well.

There seem to be two general tendencies in modern practice. One is to make the

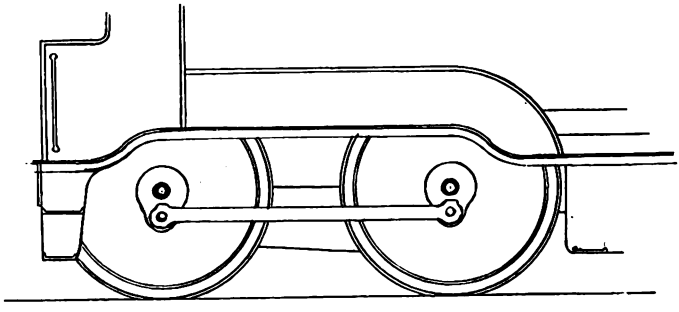

FIG. 5. STANDARD 4–4–0 CLASS, GREAT NORTHERN RAILWAY.

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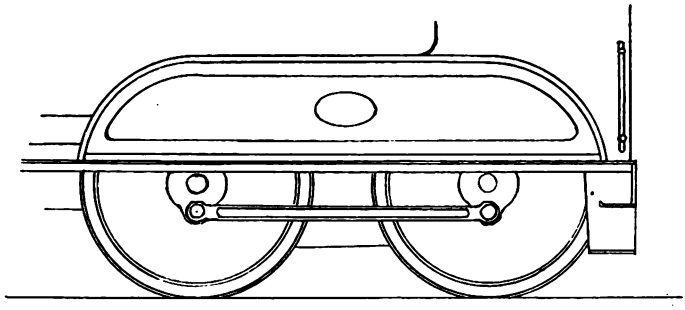

FIG. 6. MR. WORSDELL'S DESIGN, NORTH EASTERN RAILWAY.

splashers continuous; this is very noticeable on the London and North Western and Great Central Railways. The other, perhaps more widespread, is to raise the footplates. Certain lines, notably the Great Northern, have always been partial to this method; but the Great Western, with its various classes of outside cylinder engines, has developed this pattern very highly. And it must be admitted that this offers the easiest solution of the problem when outside cylinders and Walschaert's motion are combined, as on the London, Brighton and South Coast *Bessborough* and *Charles C. Macrae*. The alternative is to enclose the motion, leaving openings in the splasher sides as on the London and North Western "Claughtons" and perhaps less successfully from the point of view of appearance, on the earlier London and South Western 4-6-0 locomotives. In the case of goods engines, in many cases the simplest plan is to raise the running board entirely above the wheels; this is done on the Great Northern 2-8-0 mineral engines of Mr. Gresley's design.

It is interesting to note how old practices die hard. The latest South Western 4-6-0's and the Great Northern 2-6-0 "Moguls" have the running board raised very high to clear the outside motion. Yet the tops of the wheels are still covered by a diminutive splasher, in the Great Northern engine not more than a few inches high.

It has been the aim of this article to show that there is some reason for the apparently innumerable types of splasher; any generalizations, of course, cannot meet every case, as the conditions vary so widely, even on similar locomotives of the same railway. It is often a question of the spacing of wheel centres, and any treatment of the subject cannot be as complete as might be desired. But it is hoped that this brief account has been adequate enough to show not only the use of the splasher, but that it has played and still plays no unworthy part in helping to make up that general air of neatness which is, one is proud to think, traditional in British locomotive practice.

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THE RAILWAY PORTRAIT GALLERY.

MR. J. A. HOOKHAM,

Locomotive, Carriage and Wagon Superintendent, North Staffordshire Railway.

MR. J. A. HOOKHAM, who has taken the place of the late Mr. J. H. Adams, as Locomotive, Carriage and Wagon Superintendent, North Staffordshire Railway, commenced his railway training as a pupil on the London, Chatham and Dover Railway under Mr. William Kirtley, at the Battersea Works. After serving in the various workshops and drawing office, he had running experience for about six months as a fireman. Subsequently, Mr. Hookham was engaged as a draughtsman at the Battersea Works, and on leaving there was employed in the same capacity with several private firms. After about four years' absence, he returned to the London, Chatham and Dover Railway, and was engaged as a draughtsman, also teaching classes in technical subjects at the Battersea Polytechnic. When the South Eastern and Chatham and Dover systems were amalgamated, Mr. Hookham was transferred to Ashford Works, and remained there until he was appointed Locomotive Superintendent of the Donna Thereza Christina Railway, Brazil, in 1900. Two years later this railway was taken over by the Brazilian Government. Shortly afterwards Mr. Hookham resigned his position, and in October, 1902, commenced his engagement as Locomotive Works Manager at Stoke, from which position he now takes charge of the department. In 1904 he became a member of the Institution of Mechanical Engineers.

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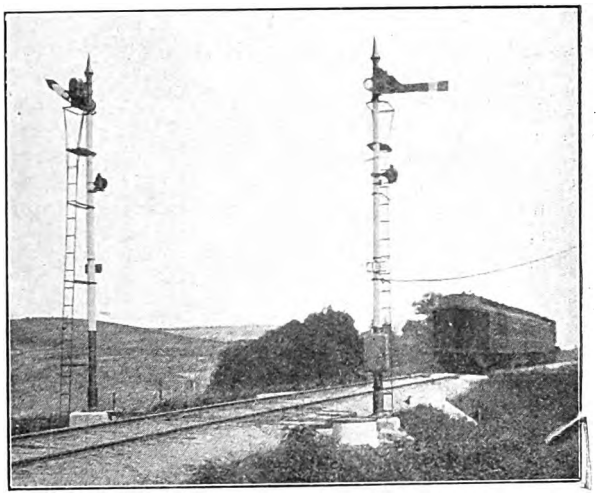
Railway Electrical Progress and Practice.

SINGLE-TRACK AUTOMATIC SIGNALS ON A CANADIAN RAILWAY.

By "INDICATOR."



TWO DIRECTION SIGNALS AT SUMMIT.

AUTOMATIC signals are now used so extensively that unless an installation includes features of special note there is little justification for extended note. But there is a growing tendency for using them also on single-track lines, where special conditions apply, and the following particulars of an installation recently completed by the General Railway Signal Company of Canada, and applying to a single-track line of considerable importance, will be of interest.

The Toronto Hamilton and Buffalo Railway forms a connection between the Canadian Pacific on the north and the New York Central lines on the south. Traffic is heavy, the average being thirty-two trains a day, and the maximum fifty-two trains a day, as follows: Freight, westward, average six, maximum ten; passenger, westward, average ten, maximum sixteen; freight, eastward, average six, maximum ten; passenger, eastward, average ten, maximum sixteen.

Formerly trains were operated by the telegraph block or time interval system in connection with train order boards, and in some cases by standard semaphore train order signals. Trains following a passenger train were held at train order stations until passenger train was clear of the block, and a time interval of five minutes was maintained at train order stations between following freight trains. Train orders and instructions regarding train movements were transmitted by telephone, and there was a telephone at each passing siding so that trainmen could communicate direct with the dispatcher when occasion required.

During the summer of 1911 the Toronto Hamilton and Buffalo Railway began its first automatic block signal installation on nine miles of track, from Kinnear to Vinemount, Ont. In 1913 this was extended from Vinemount eastward to Welland, 26 miles, and in 1914 signals were installed on the west end from Hamilton to Brantford, 25 miles. There remains, approximately, 16 miles of single track between Hamilton and Brantford which is not equipped with automatic block signals.

The system of signalling is the General Railway Signal Company's "absolute permissive" block system, in which the block for opposing trains is from siding to siding, and for following trains the block is from signal to signal as in double track signalling.

Signals governing movements from passing sidings into adjoining blocks, as signals 4, 5, 12 and 13, I. and II. in the series of traffic diagrams on page 55, are in all cases absolute, and when in the stop position must not be passed, as the block may be occupied by an opposing train. Signals governing trains approaching a siding, as signals 3, 6, 11 and 14, I. and II., are permissive, and when in the stop position may be passed after a stop has been made in accordance with the rules. Intermediate signals, as signals 7, 8, 9 and 10, I. and II., also are permissive.

Ordinarily there are two or three pairs of intermediate signals between passing sidings, but in some cases there is only one pair, in which case the intermediate signals are staggered so as to provide an adequate margin of safety if a train should disregard an absolute stop indication and enter a block

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occupied by an opposing train. In diagram II., train 2 has entered the block between sidings A and B, and is protected against opposing train 1 by absolute signal 5, which is in the stop position.

Diagram III. shows the minimum spacing of following trains running under caution signals, and Diagram IV. the minimum spacing of following trains running under clear signals. In both cases absolute signal 5 protects against opposing trains. There is also a caution indication for each stop indication.

Diagram V. shows opposing trains 1 and 2 approaching meeting point at siding B, and illustrates one of the important features of the absolute permissive block system—the double distant or caution indication, signals 7 and 9, and signals 12 and 14, which affords maximum safety at meeting points, and insures proper signal indications. Owing to the arrangement of the control circuits it would be practically impossible for train 1 to pass signal 7 at clear and then find signal 9 at stop, or for train 2 to pass signal 14 at clear and then find signal 12 at stop. Absolute signals 10 and 11 protect against opposing trains.

Diagram VI. shows trains 1 and 2 at siding B. Permissive signals 9 and 12 are at stop, and serve as a reminder that a meet is to be made at this point.

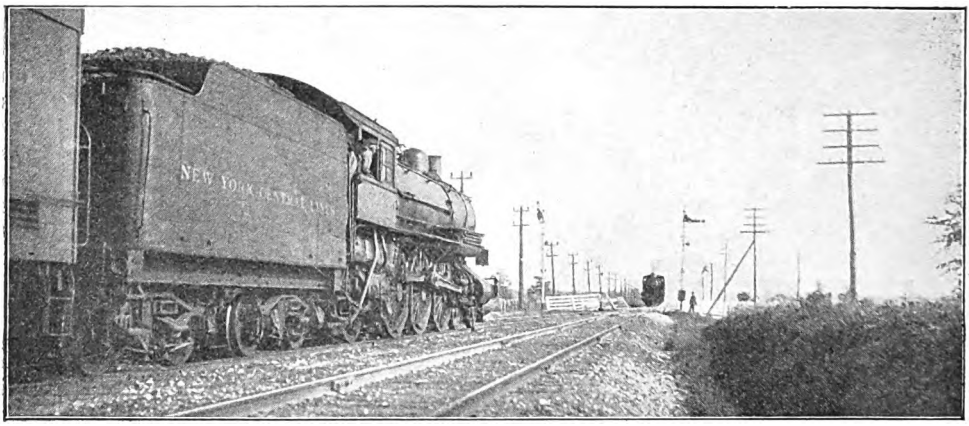
In Diagram VII. train 1 is about to meet trains 2 and 4 at siding B. Train 1 enters the siding and proceeds into the next block under authority of a clear indication at signal 11. Signal 10 goes to clear as soon as train 1 enters the siding and switch is restored to normal position, and train 2 proceeds towards siding C.

Diagram VIII. shows the trains proceeding in their respective directions. When train 2 passes signal 8, signal 10 goes to caution and train 4 can advance on this indication.

Intermediate switches are, in most cases, equipped with push-button indicators of the semaphore type, and normally indicate block is not clear. Before opening the main line switch trainmen are required by rule to press the push-button; if conditions are such that it would be safe to enter the main track, the indicator blade operates to the vertical position, and indicates block is clear. If the block is not clear, the indicator blade remains in the normal position.

This arrangement of de-energised switch indicators reduces to a minimum the chance of false clear indications. The push-button operates two contacts, which make and break both sides of the energising circuit. The resistance of indicators is 690 ohms. Main line switches are equipped with model 5 switch circuit controllers through which, in some cases, the control circuits are broken, and in other cases the track circuits are shunted.

The length of track circuits varies considerably, according to the distance between successive signals; average length is approximately 2,000 ft., and maximum length about 4,000 ft. Ballast is rock and gravel, affording good drainage; ties are untreated oak and cedar; all rail joints, including insulated joints, are of the continuous type; two 44 in. bond wires connect adjoining rails at each joint.



TRAINS NOS. 73 AND 78 MEETING AT GRASSIES.

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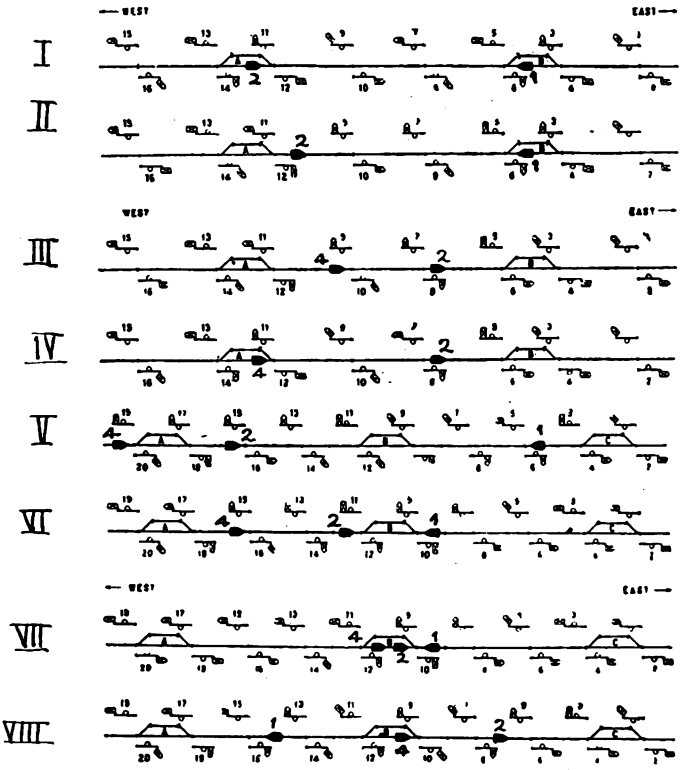
Each track battery consists of two cells of Columbia 600 ampere-hour, high internal resistance type, housed in 8 ft. cast iron battery chutes. Track relays have a resistance of 4 ohms; front contacts are platinum to graphite, and back contacts platinum to platinum. These relays are housed in cast iron relay boxes, which are mounted on the signal mast or on a cable post, depending upon the particular location.

Weatherproof and copper clad, the signal control wires are supported on a separate cross arm below the telegraph line, which was practically reconstructed before the signal wires were strung. Wires extending from line to function are formed into a cable, held together with marline, and supported by messenger wire. Line circuits are operated under the polarised line control system, which requires one less line wire than a similar neutral control system.

Ordinarily there are three line wires extending from sidings and five line wires extending through sidings. All relays and other mechanisms likely to be affected are protected by lightning arresters, to which are attached suitable connections to ground.

The signals conform to Railway Signal Association specifications; signal mechanisms are G.R.S. model 2 A top of mast type, operating in three positions in the upper right-hand quadrant, and are equipped with 10-volt direct-current motors. Absolute signals are distinguished by a square end red blade and by a red marker light below and in the same vertical plane as the active light. Permissive signals are distinguished by a pointed end red blade and by a red marker light below and to the left of the active light.

Lights at night are red for stop, yellow for caution, and green for clear. The automatic signals are numbered according to their



DIAGRAMS SHOWING OPERATION OF SINGLE TRACK AUTOMATIC SIGNALS.

I.—Trains at adjacent sidings. II.—One train in block. III.—Minimum spacing under caution signals. IV.—Minimum signals under clear signals. V.—Trains approaching meeting point. VI.—Trains at meeting point following eastward trains. VII.—Trains meeting. VIII.—Trains proceeding from meeting point.

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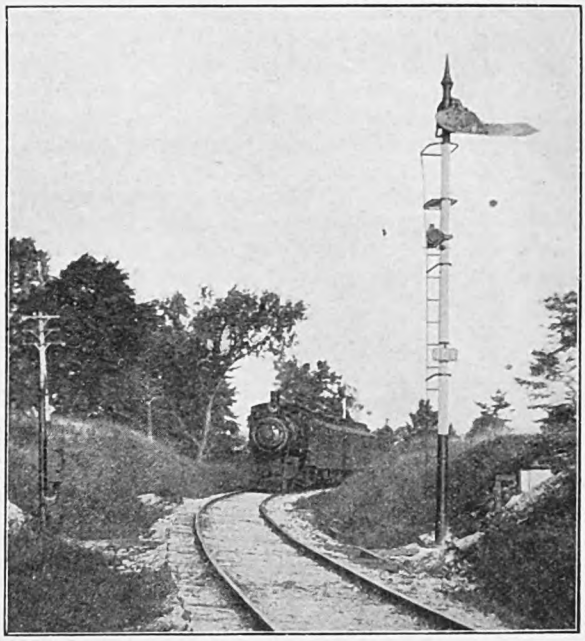


TRAIN NO. 4 PASSING SIGNAL NO. 461.

respective mile-post locations; odd numbers are assigned to signals governing west-bound trains, and even numbers to signals governing east-bound trains. The figures are arranged horizontally on the number plate. Top and bottom parts of the signal masts and fittings are painted black, and the intermediate part, white, making a conspicuous signal, which stands out clearly against the usual backgrounds. Semaphore lamps equipped with long-time oil burners.

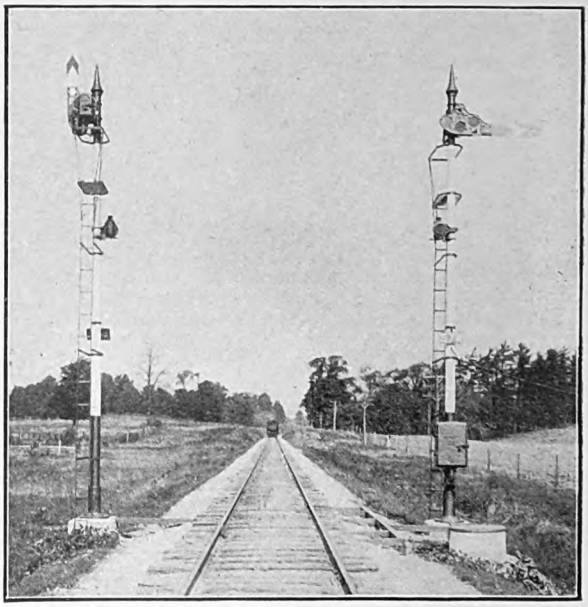
Each signal is operated by sixteen cells of standard potash battery, which is housed in a concrete battery well.

The railway company furnished and installed in place all insulated joints, insulated switch rods and connections, also all line wire supports. The General Railway Signal Company manufactured and installed in place all signals and signal appliances. Most of the material was delivered by work train. Signals were erected by means of a derrick, which was also used in setting the concrete battery wells. Mr. R. L. Latham, Chief Engineer, Toronto Hamilton and Buffalo Railway, had general charge of the installation, which was performed under the immediate supervision of Mr. A. A. Hurst, Supervisor of Signals. Mr. A. C. Holden was engineer in charge for General Railway Signal Company.

Rules governing use of the automatic signals as adopted by the railway officers, were printed in the back part of the time table with the operating rules. When the signals were ready for service, the railway officers held at Hamilton several meetings for instruction of the trainmen. The automatic signal system was thoroughly explained and discussed in connection with lantern slides of the signal aspects and indications which were thrown on a screen.

A model signal mounted on a short mast, an indicator, a switch circuit controller, and other signalling appliances, which were operated as under service conditions, afforded a practical demonstration of the signal system, and fixed firmly in the minds of employés the essential features of the system.

The officers of the Toronto Hamilton and Buffalo Railway state that they are well satisfied with the results obtained by the



BOTH DIRECTION SIGNALS BETWEEN CAINSVILLE AND JERSEYVILLE.

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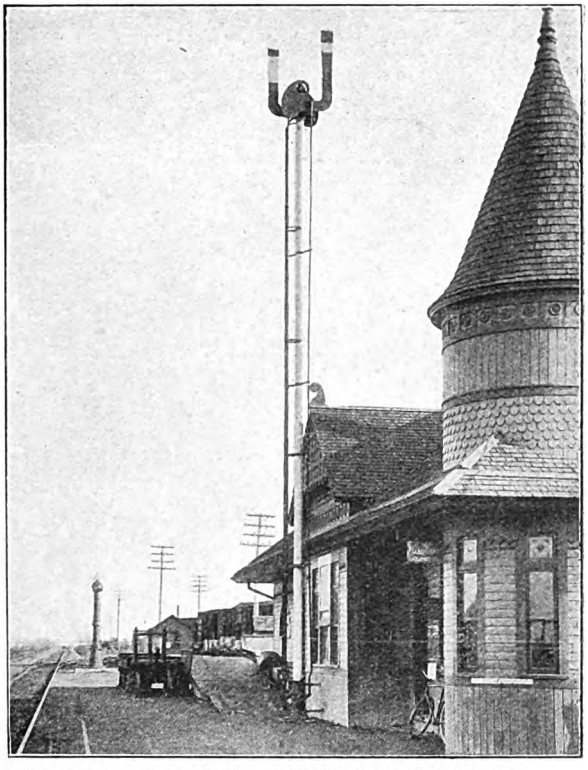
automatic signals, which may be briefly summarised as follows: (1) Under proper observance of the indications, the signals provide for opposing as well as following movements, a definite space interval which practically eliminates the liability of collisions. (2) Misplaced switches, broken rails, or any breaks in the continuity of the track cause the display of a stop indication at the signal governing entrance to the block, and thus greatly reduces the liability of derailments. (3) Increase the traffic capacity of line, as one train can follow another as soon as the first train passes the first signal in advance, which is accomplished in considerably less time than the prescribed interval of the telegraph block. (4) Afford maximum protection at meeting and passing points, serving as a check on dispatchers' orders, also as a reminder to trainmen at scheduled meeting and passing points. (5) More than double the safety factor in connection with flagging, as an approaching train would, in most cases, meet a caution or stop indication before the flagman could go out far enough to ensure adequate protection. (6) Owing to the high degree of protection the automatic signals afford, "nineteen" orders may be used in many cases where "thirty-one" would otherwise be used.



TRAIN ORDER SIGNAL AS INSTALLED AT SMITHVILLE.

You are earnestly requested to hand in at any post office in Great Britain and Ireland all the magazines you can spare to be sent by organisations approved by the War Office and Admiralty to soldiers and sailors. No postage need be paid, and no wrapping is required.

We have received many letters from men in the fighting forces expressing appreciation of the "Railway Magazine," and it is hoped when you have done with this copy you will take advantage of the facilities provided by His Majesty's Postmaster-General.

There are over 100,000 men in the British Army and the Navy who in civil life were in railway employment.—Ed. "R.M."

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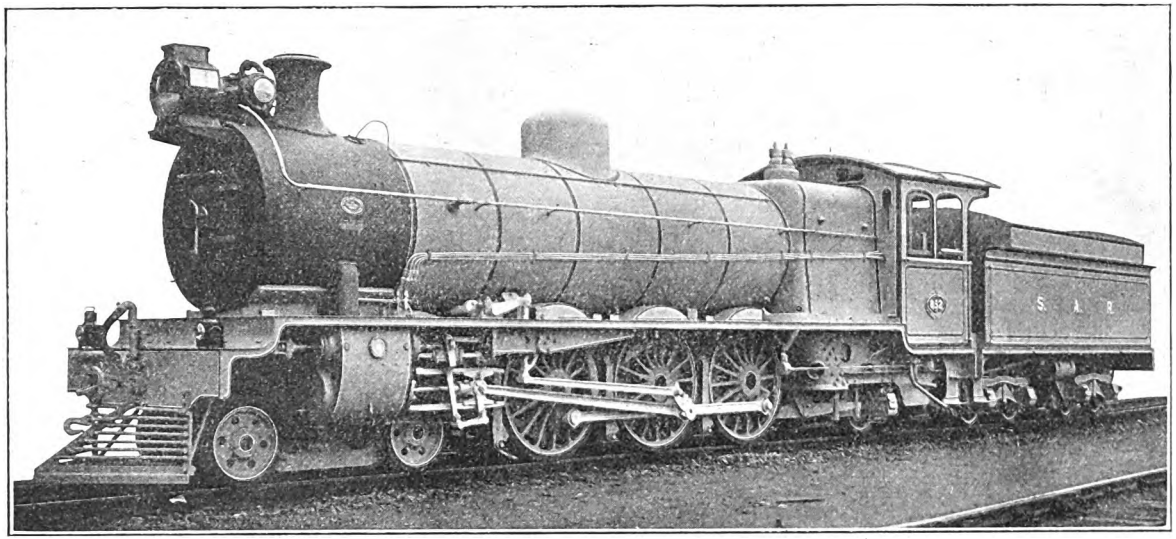
FOUR-CYLINDER SIMPLE SUPERHEATER LOCOMOTIVE: SOUTH AFRICAN RAILWAYS.

Designed by Mr. D. A. Hendrie, Chief Mechanical Engineer, and built by the North British Locomotive Co., Ltd.



As a development of the large 4–6–2 engines of Class 16, also designed by Mr. Hendrie, these engines constitute a notable advance, even upon their exceptional predecessors, and they constitute almost the first instance of the use of four high-pressure cylinders in South Africa. A Schmidt superheater is fitted, and the cylinders are so arranged that those outside drive the middle pair of coupled wheels and the inside ones the leading pair. The inside cylinders are placed slightly in advance of those outside, and their valves are operated by rocking levers taking motion from the valve spindles of the outside cylinders. Valve gear is of Walschaert design. The fire-box is of the Belpaire pattern, sloping at front and rear.

LEADING DIMENSIONS :—

Gauge	3 ft. 6 in.	Heating surface, tubes	1,975 sq. ft.
Cylinders	14 in. × 26 in. (4)	,, ,, fire-box	146 sq. ft.
Wheels, coupled, diameter	5 ft.		
,, front bogie	2 ft. 6 in.	,, ,, total	2,121 sq. ft.
,, trailing	2 ft. 9 in.	,, ,, superheater	460 sq. ft.
Wheelbase, coupled	10 ft. 9 in.		
,, engine, total	31 ft. 1 in.	,, ,, total	2,581 sq. ft.
Steam pressure	200 lbs. per sq. in.	Grate area	36 sq. ft.
Adhesion weight	50 tons 14 cwt.	Tender, water capacity	4,250 gals.
Weight of engine	81 tons 2 cwt.	,, coal ,,	10 tons

Weight of engine and tender in working order .. 132 tons 8 cwt.

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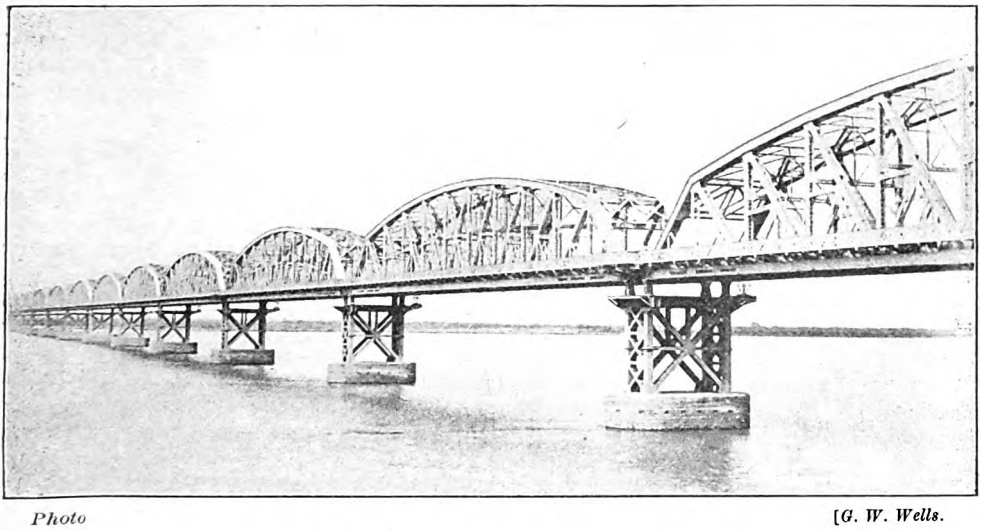

Photo [*G. W. Wells.*

GENERAL VIEW, FROM THE SARA BANK, OF THE "HARDINGE" BRIDGE, EASTERN BENGAL STATE RAILWAY.

The "Hardinge" Bridge: Eastern Bengal State Railways.

THIS bridge, sometimes referred to as the Lower Ganges or Sara bridge, but now known as the "Hardinge" Bridge, since it was opened for traffic in March, 1915, by the Viceroy of India, in commemoration being named after Lord Hardinge, takes rank as one of the most remarkable yet built by British engineers, coming next, in fact, to the Forth Bridge.

It connects the broad gauge system of the Eastern Bengal Railway south of the River Ganges with the railways north of that river. The Sara-Sirajgunj Railway (recently sanctioned) will have through connection with Calcutta, and traffic north of Santahar will be transhipped at a large transhipping yard near that place from metre to broad gauge and *vice versa*. Conversion of the metre gauge to broad gauge at first up to Parbatipur and then to Siliguri is a development expected to follow the opening of the bridge.

The construction of the bridge was proposed and discussed more than 20 years before it was finally sanctioned in 1908. Proposals put forward by the Eastern Bengal State Railway in 1889 were investigated by a committee and reported feasible. In 1902 Mr. (now Sir) F. J. E. Spring prepared a detailed project. There was much general discussion as to the site of the bridge, and in 1907 a committee representing commercial interests recommended one of the Sara sites, which had also been favoured by Mr. Spring. A technical committee appointed in 1908 reported that a bridge could be constructed, and advocated a site near Sara. This was followed by the sanction of the Secretary of State to the construction of the bridge at or near Sara, and the appointment of Mr. R. R. Gales, M.Inst.C.E., as engineer-in-chief at the close of 1908.

The earlier proposals projected a single-line bridge with a headway of 33½ ft. at high flood level and guide bunds on each bank. Further investigation and experience of the vagaries of the river and the increase of traffic have resulted in the final designs for a double-line bridge capable of carrying the heavier loads of the future, a headway of 40 ft., a public footway and guide bunds at Raita and Sara, in addition to much more heavily protected guide banks at the site of the bridge.

The problem of training and keeping the river to its course through the bridge was the most difficult the engineers had before them. The system adopted is that originated by the late Mr. J. R. Bell for rivers with erodible banks. At the bridge site there are two

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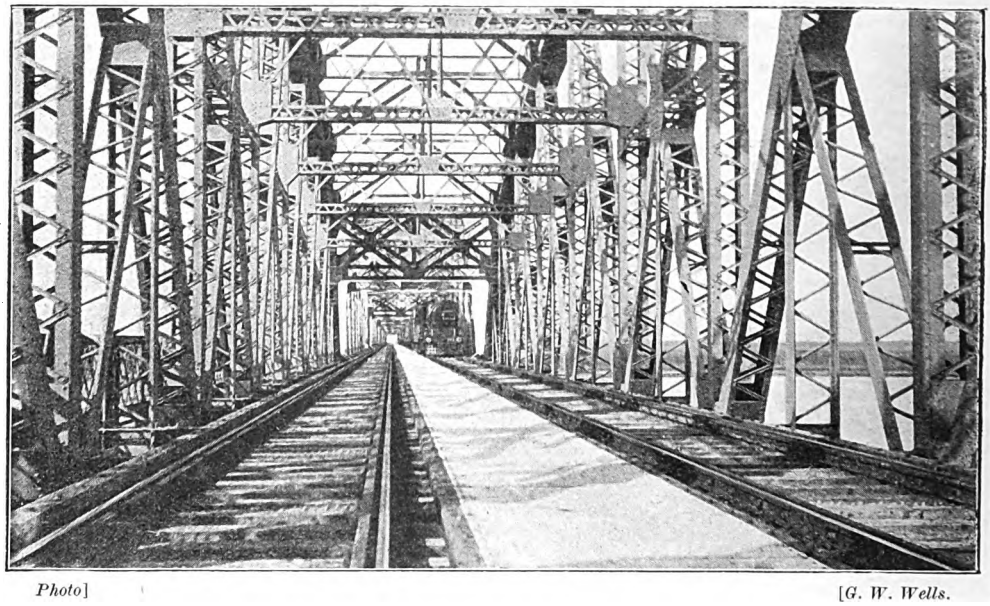
guide banks of the Bell bund type. Each is 4,000 ft. long and extends 3,000 ft. above the bridge and 1,000 ft. down-stream. The ends are curved inwards and heavily pitched with stone. The bund consists of a core of earth raised 18 ft. above highest flood level, protected on its river slope with a covering of pitched stone 2 ft. to 3½ ft. thick.

It has been possible to make these guide banks shorter than would otherwise have been necessary, owing to the existence at Sara, 3 miles above the bridge on the left bank, and at Raita, 7 miles up-stream on the right bank, of benches of clay of considerable extent, which form semi-permanent points in the banks of the river. To render these points permanent and thus confine the river to a comparatively straight approach to the bridge they have been reinforced with stone-pitched guide banks and aprons, each being 4,000 ft. long. Owing to the fact that no stone is obtainable in the vicinity of the bridge, all the stone has had to be brought from considerable distances.

There are in the bridge 15 main spans of 345 ft. 1½ in. centre to centre of bearings on piers spaced 359 ft. apart, and at each end there are three land spans of 75 ft. The total length of the bridge is about 5,900 ft. from abutment to abutment. The main girders have an overall depth at the centre of 52 ft.; the width from centre to centre is 32 ft., and the total width of the bridge, including the footway, 48 ft. 6 in. Each of the trestle tops is in the form of a square table, so as to carry the cast steel bearings under the main spans. These bearings, which are 5 ft. 7 in. high, are of the rocker type, in order to allow for expansion and contraction.

At the fixed ends of the spans the bearings are made in two pieces—a pedestal bolted to the trestle top and a saddle bolted to the underside of the bearing plate of the span. At the expansion ends of the spans the bearings are in three parts, the pedestal and saddle bolted as before mentioned, and a rocker with knuckle ends fitting into sockets on both pedestal and saddle. The rocker bearing at the expansion end is designed to take an estimated horizontal movement due to change of temperature and load of 3¼ in. The main girders of each span are of the hog-back N type, with sub-panels.



Photo] [*G. W. Wells.*

VIEW IN CENTRE OF BRIDGE, SHOWING APPROACHING GOODS TRAIN.

The floor of the bridge is of the open type, the rails being carried on sleepers laid on longitudinal timbers resting directly on the stringers. On both sides of the bridge at the ends of each span refuges are provided for the safety of the men working on the bridge. Including the footway, but excluding the bearings, the total weight of each of the 15 main spans is no less than 1,216 tons.

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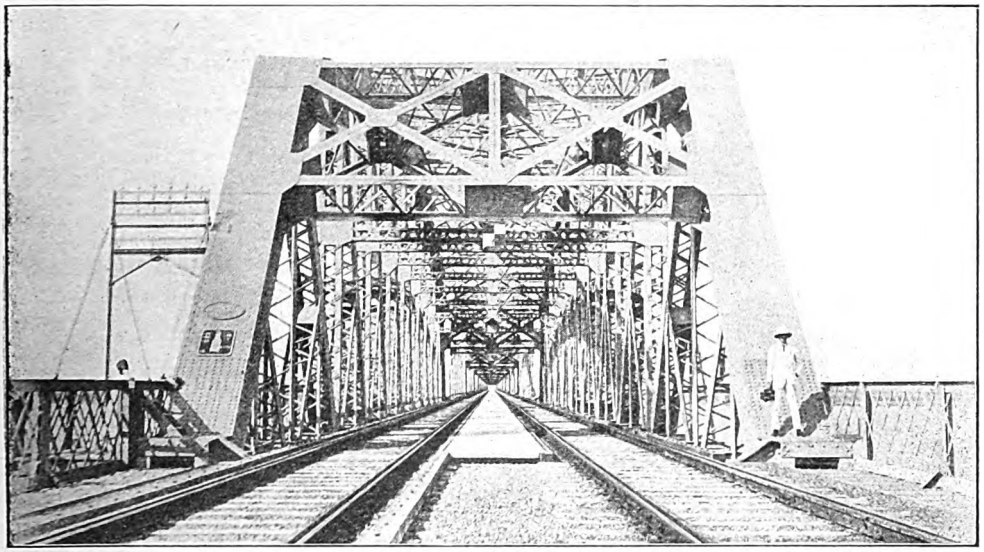
The whole of the structural work comprised in the Lower Ganges Bridge was built in accordance with the British Standard Specification for structural steel bridges, and to detailed designs prepared by Messrs. Rendel, Palmer & Tritton, of Westminster, consulting engineers to the India Office. Nine of the 15 main spans were built by the Cleveland Bridge & Engineering Co., Ltd., of Darlington, and the remaining six by Braithwaite & Kirk, Ltd., of West Bromwich. To facilitate erection at the site each of the 15 spans was painted by the contractors in a different colour.

The total weight of the steel work in the girders is nearly 21,000 tons.

In order to reduce the weight on the foundations the upper parts of the piers were constructed as steel trestles. The piers are carried on well foundations, the tops of which are 3 ft. above lowest water level. In plan the masonry portion of the pier is 55 ft. long and 29 ft. wide, with semi-circular ends and straight sides. It has a base of reinforced concrete 6 ft. deep. Above that the pier is faced with moulded concrete blocks and hearted with brick-work in cement. There is a cap of reinforced concrete $6\frac{1}{2}$ ft. deep, which encloses a heavy steel grille foundation to distribute the loads on the trestle legs and temporarily to carry the bearings of the service girder.

The two abutment piers, which carry only one main bearing, have been constructed of masonry to the full height. They have bases of reinforced concrete about 11 ft. deep, and above that they are built of concrete faced blocks with a core of mass concrete, capped with a 3 ft. slab of reinforced concrete which encloses steel grilles for distributing the girder loads. In the 16 main piers there are about 47,800 tons of masonry and 3,150 tons of steel.

The section of line which includes the bridge and its approaches, is about 15 miles long. It leaves the Eastern Bengal Railway just north of Bhairamara station, and joins the northern section of that railway about 3 miles south of Gopalpur. From the Calcutta side the approach line is graded up to the bridge at 1 in 400 for a distance of about $3\frac{1}{4}$ miles. On the Siliguri side there is 2,000 ft. of level at Paksey station, and thence the line is graded down at 1 in 500 for about $3\frac{3}{4}$ miles. At the abutments the approach banks are 50 ft. high. The earthwork in these approaches reaches the large total of 160,000,000 cub. ft. There are two stations in this section—Paksey at the left abutment of the bridge and Ishurdi about 6 miles north of the bridge. The latter will be the junction station for the Sara-Sirajganj Railway. Up to Ishurdi the line will be double, and beyond that single.



Photo] [*G. W. Wells.*

END VIEW OF THE BRIDGE FROM SARA BANK.

We are indebted to one of our old readers, now employed as an assistant locomotive superintendent, Eastern Bengal State Railway, Mr. G. W. Wells, A.M.I.L.E., for the remarkable photographs used to illustrate this article.

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A New Ambulance Train for Home Railway Service.

Equipped at Eastleigh Carriage and Wagon Works: London and South Western Railway.

FOR the last twelve months little has been heard concerning the various ambulance trains provided at the commencement of the war for service on the home railways, and principal interest has been aroused by those supplied for Continental service. The original trains have, unfortunately, been in constant request, and have rendered exceptional service, and we are now able to refer to an additional train which is being equipped at Eastleigh Carriage and Wagon Works, London and South Western Railway, under the direction of Mr. Surrey Warner, this being the second train furnished by this company.

The train will consist of ten vehicles, transformed from ordinary stock and altered to meet the requirements of the Army Authorities. There will be six ward cars, an officers' and nurses' coach, kitchen, etc., miscellaneous stores and guard's van, and pharmacy, providing accommodation for about 120 cot patients, besides the requisite R.A.M.C. staff.

Converted from guards' vans the wards are lettered from "A" to "F." Beds are numbered and arranged in two tiers, the lower ones supported by stanchions from the floor, and the upper cots from the side pillars. The latter, when not in use, can be folded against the sides of the coaches.

Flush cisterns and water-sealed closets are fitted in all lavatories, and the floors covered with lead, the doors being made to slide. In the vestibule are a folding table, rack to hold basins and a wash-basin.

The officers' and nurses' carriage has been adapted from an emigrant corridor composite. In each sleeping section are two beds, a wardrobe and seat, while the sitting-room is furnished with four arm-chairs and a table, and in the centre of the vehicle are a bathroom and guard's compartment.

The pharmacy car is specially equipped. In the treatment room is a bath, screened off by a curtain.

Lighting is partly by incandescent gas and partly electric, and ventilation is afforded by drop-lights and the latest pattern torpedoes in the roof. All vehicles are fitted with Westinghouse and Vacuum brakes complete and passenger communication, while every precaution has been taken to ensure an ample water supply. Other adjuncts include cup-holders, a boarding ladder, platform ramps, an infectious clothing cupboard, etc. The exterior of the train is to be renovated in the London and South Western Railway standard colour, with the Geneva Cross in red on a white ground painted prominently on both sides of every vehicle, as well as on the roof.

It is understood that the train, when completed, is to be put on exhibition at principal stations, a small charge being made on behalf of funds for providing comforts for the railway troops.

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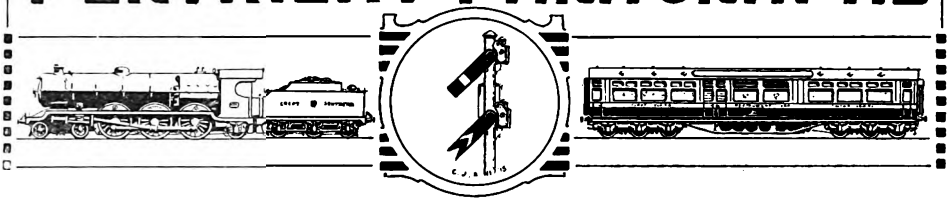
PERTINENT PARAGRAPHS



Parliamentary Bills for 1916.

It could hardly be expected that there would be many Parliamentary Bills deposited by railway companies for consideration during the 1916 session. Those which have been filed, four in number, including one Scottish order, are mainly of an essential or special character. The South Eastern and London, Chatham and Dover Railway Companies ask for powers for the alteration and strengthening of Charing Cross Bridge, applying mainly to the six spans over the river. The work will involve alterations and interference with the bed and foreshore of the river, and sanction for this is required, also for placing in position appliances for the use of the workmen. The North British Railway desires powers for acquiring the Whiteinch Tramway; for diverting and altering streets; and for taking over the carting business, hitherto conducted by Messrs. Mutter, Howey & Co., on their behalf. Short bills have also been introduced by the Alexandra (Newport and South Wales) Docks and Railway Company and the Cardiff Railway Company, these applying mainly to extensions of time and financial aspects.

London and South Western Railway Electrification.

Towards the end of November it was officially announced that London and South Western Railway electric trains would commence running on the Waterloo, Kingston, Richmond, and Shepperton lines on Sunday, December 5th. Unfortunately, this had to be followed up by a cancelling announcement that owing to alleged interference with certain telephone circuits the Postmaster General had asked for postponement until remedial measures could be taken to overcome the difficulty. At the time of writing it is hoped it will be practicable to run the trains over this route before the end of December. The sections covered embrace the principal residential area affected under the new suburban electrification scheme, and important amplifications of travel facilities are associated with the inauguration of electric traction on these routes. The new arrangements provide for a ten-minute service of electric trains each way throughout the day on the "roundabout" section between Waterloo and Kingston *via* Wimbledon, Raynes Park, and Malden; also *via* Putney, Barnes, Richmond, and Twickenham. For Shepperton line stations the service is every half-hour, with extra trains during business hours. For main line stations between Waterloo and Malden, and Windsor line stations between Waterloo and Twickenham, steam trains are available in addition. The "loop" line *via* Hounslow, and the Surbiton and Hampton Court section, will be ready for electrical working shortly. Full details of the new electrical services and improved steam train arrangements are included in the Company's new official time-table, which is appearing, it is understood, in a new cover and with several changes.

In view of the completion of the electric power station at Wimbledon, the London and South Western Railway have decided to shut down the generating station of the Waterloo and City line in due course, the power supply therefor being obtained from the Wimbledon station.

A Lancashire and Yorkshire Railway "Roll of Honour."

An artistic volume has been issued by the Lancashire and Yorkshire Railway as a record of their "Roll of Honour." It includes the names of 6,178 Lancashire and Yorkshire railwaymen serving with His Majesty's Naval and Military Forces, or who have fallen in the war. It shows the departments and stations from which the men were drawn, also the names of the men from each department who have been reported killed, wounded, missing, or prisoners of war.

The following are the numbers of men who have joined the forces from the declaration of war on August 4th, 1914, up to August 31st, 1915:—

Department.	Number.	Percentage to Total Staff in Department.
1. General Manager ..	6	25·00
2. Secretary, Hotel and Refreshment Rooms ..	81	22·95
3. Chief Goods Manager ..	1,795	18·09
4. Superintendent of the Line	983	11·48
5. Chief Civil Engineer ..	577	13·19
6. Chief Mechanical Engineer—		
Locomotive ..	1,860	17·6
Carriage and Wagon	536	17·4
7. Solicitor	3	20·0
8. Chief Accountant ..	5	13·16
9. Audit Accountant ..	22	14·57
10. Land and Estate Agent	12	21·5
11. Stores	119	23·19
12. Goole Steam Shipping..	147	13·76
13. Marine—		
East Coast.. ..	14	3·3
West Coast ..	18	10·77
Total	6,178	16·34

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Particulars of distinctions won by Lancashire and Yorkshire railwaymen during the present war are:—Capt. E. C. Simpson, Military Forwarding Officer, Military Cross · Pte. J. Barker, 1st East Lancs. Regt., D.C.M.; Cpl. C. Brownlow, 1st East Yorks. Regt., D.C.M.; Pte. R. Casey, Lancs. Fusiliers, D.C.M.; Pte. T. Hayes, 2nd Yorks. Regt., D.C.M; Pte. G. E. Stockham, R.N. Auxiliary S.B. Res., D.S.M.; Staff-Sgt E. Walch, R.N. Auxiliary S.B. Res., D.S.M. Under the signature of Mr. J. A. F. Aspinall, General Manager, it is stated that "The roll is published as a permanent record of, and tribute to, the Lancashire and Yorkshire Railwaymen under arms, and as an earnest of the good wishes of their fellow railwaymen at home for victory and a safe return."

Irish Railways and the Great Storm of November 12th.

We are indebted to Mr. H. W. Lea for particulars of the disastrous effects of the great gale of November 12th on the railways running into Dublin. Owing to the fact that the wind was from the north-east Dublin Bay experienced the full force of the gale, and the sea wall along the Dublin and South Eastern Railway from Kingstown to Merrion gave way in several places, while it was more or less damaged for the whole distance. The sea broke in across the railway and fields, and even flooded the road from Merrion to Booterstown to a depth of from 2 to 3 ft. No trains left Westland Row that afternoon or night and the Company accomplished wonders in getting the wreckage of the wall removed, replacing sleepers, etc., in time to run trains from about 9 a.m. on the Saturday morning. Mr. Lea mentions that on the Saturday morning he saw the name board of Monkstown and Salthill Station lying by the rails close to Blackrock Station. Serious damage was done to Kingstown Harbour and it has been stated that the mail boat service had then to be suspended for the first time for 60 years. In regard to this a statement has been issued that the fairway between the entrance to Kingstown Harbour and Carlisle Pier was at the time blocked by a number of vessels anchored there, so that even the night mail packet could not leave Kingstown. Under these circumstances a "wireless" was sent to the *Ulster*, which by that time had left Holyhead with the day mail, and was on its way, to return instead of attempting to enter Kingstown Harbour. This was accordingly acted upon by the captain of the *Ulster*. Owing to the great damage done to the Dublin and South Eastern Railway between Bray and Wicklow, no trains could be run for several days between these towns and the Company gave notice that passengers must find their own conveyances. Had it not been for the new diversion of the line inland from Killiney to Bray, the latter town would also probably have been cut off from Westland Row.

Passenger traffic service on the Dublin and South Eastern Railway between Dublin, Wexford, and Waterford is now fully resumed. Owing to the violence of the storm, the line between Bray and Newcastle was seriously damaged, and the through service between Dublin and Greystones and stations south thereof had to be suspended for a time. The full service as between Dublin and Bray was, however, maintained by both lines, and a limited local service was run between Wexford, Waterford, Shillelagh and Wicklow.

On the Midland Great Western Railway great delay was caused by trees and telegraph poles blown across the lines. The Limited Mail due Broadstone 7.12 p.m. did not arrive till 3.50 a.m. next morning, the Cavan train due at 5 p.m. was 13 hours late and other trains were similarly held up. The 5 p.m. and later trains from Broadstone could not get away. The other lines suffered to a less extent, the Great Southern and Western mail from Cork being a mere two hours late.

The "Brighton" Ambulance Train.

So great was the public interest shown when the ambulance train equipped by the London Brighton and South Coast Railway for service in France was placed open for public inspection, as noted last month, that in response to general desire the train was again exhibited at various stations as follows: Portsmouth, Sunday, November 14th; West Croydon, Monday and Tuesday, November 15th and 16th; Eastbourne, Wednesday, November 17th; Bognor, Thursday, November 18th; Tunbridge Wells, Friday, November 19th, and Victoria, Sunday, November 21st. Altogether nearly 35,000 people inspected the train, the receipts being upwards of £1,500.

Evolution of a Metropolitan Railway Tank Engine.

The photographs reproduced by the courtesy of Mr. S. Williamson, General Manager, Cambrian Railways, show three stages in the evolution of an engine originally belonging to the Metropolitan Railway and now in the possession of the Cambrian Company, on whose behalf it has recently been converted from a tank to a tender engine.

This engine was one of six purchased in 1905 from the Metropolitan Railway. They were found on trial to be too heavy for the branch lines of the Cambrian system, the combined trailing and driving axle weights being 33½ tons, while on the other hand it has not been practicable to make satisfactory use of the engines on the long main line runs. In consequence of this the operations of the engines have almost entirely been confined to yard shunting.

The engines were, however, in good condition, and in March, 1915, the Directors decided, upon the recommendation of the General Manager, to convert one of them as an experiment into a tender engine, and the work has been carried out by Messrs. Beyer, Peacock & Company, Gorton Works, Manchester, at a

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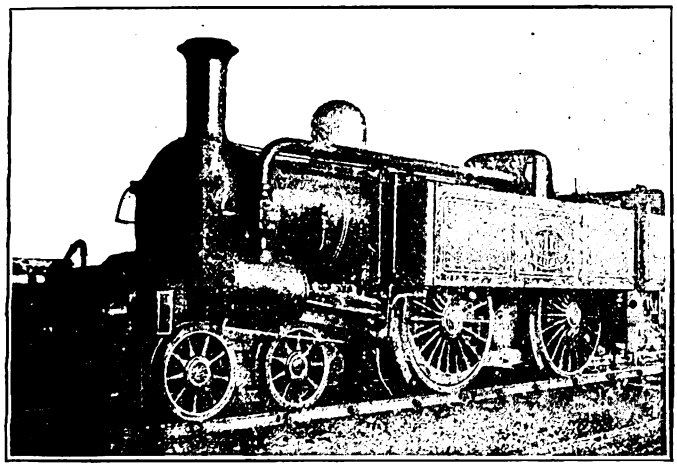


METROPOLITAN RAILWAY TANK ENGINE NO. 11 AS FIRST DELIVERED TO THE CAMBRIAN RAILWAYS.

very moderate cost. As rebuilt, the engine illustrated has been working passenger trains between Moat Lane and Brecon on the Mid Wales Section since 5th November last, and the reports of the Locomotive Superintendent and Engineer upon the result of the conversion are so favourable that the Directors are considering the conversion of the remaining engines. The tractive force of the converted engine is only slightly below that of the standard main line bogie passenger engines, and it can be worked on practically any part of the system, as the adhesion weight is now only 27½ tons as compared with 33½ tons originally. The tender for the engine was an old one, provided from stock.

"Cosmopolitan" Train Working.

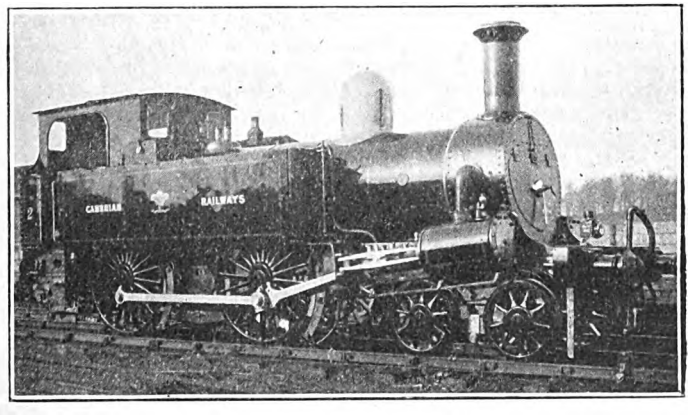
References made from time to time in these pages as to unusual instances of train working, accentuated under present conditions, are continually being amplified by further examples of corresponding interest. Mr. S. Wallace describes an even more remarkable instance of such "cosmopolitanism." On a recent Sunday he saw at Gospel Oak, on the Hampstead Junction line used by London and North Western and North London trains, a Great Eastern Hospital train, worked by South Eastern and Chatham 4–4–0 engine No. 491, piloted by a London and North Western 0–6–0 goods engine No. 22.

The Weedon Accident.

This accident, it will be remembered, occurred on August 14th near Weedon, London and North Western Railway, the second part of the 8.30 a.m. Irish mail train from Euston to Holyhead, drawn by two engines, when running at high speed between Stowe Tunnel and Weedon, being derailed, several of the vehicles being thrown over either side of the line and wrecked. Ten passengers were killed and 21 injured, some severely, and 33 cases of shock have been reported. The driver and fireman of each engine, and a guard and five dining-car attendants in the train were also injured.

In presenting his report Lt.-Col. Druitt first reviews the circumstances and the nature of the accident and the conditions created thereby. As regards the Irish mail train, however, the report is little concerned, inquiry applying mainly to the breaking loose of a coupling rod on the 8.45 a.m. up express from Birmingham, the derailment of the down train being attributable directly to the minor accident which occurred to the up train which was passing at the time.

The Inspector summarises this phase of the matter in the following terms: "I think from the above evidence there can be little doubt but that the Irish mail was derailed through the down road being pushed out of alignment by the detached coupling-rod of the engine of the 8.45 train from Birmingham. The coupling-rod of this engine came off the right-hand driving crank axle-pin owing to the screw washer holding it in position having become detached, which in turn was due to the split pin which prevents the screw washer from revolving having come out. The screw washer was subsequently found between the platforms



THE SAME ENGINE AS USED ON THE CAMBRIAN LINES.

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at Weedon station, which is 12 miles 66 chains from where the washer pin was replaced in Rugby Station."

What Happened to the Coupling-Rod.

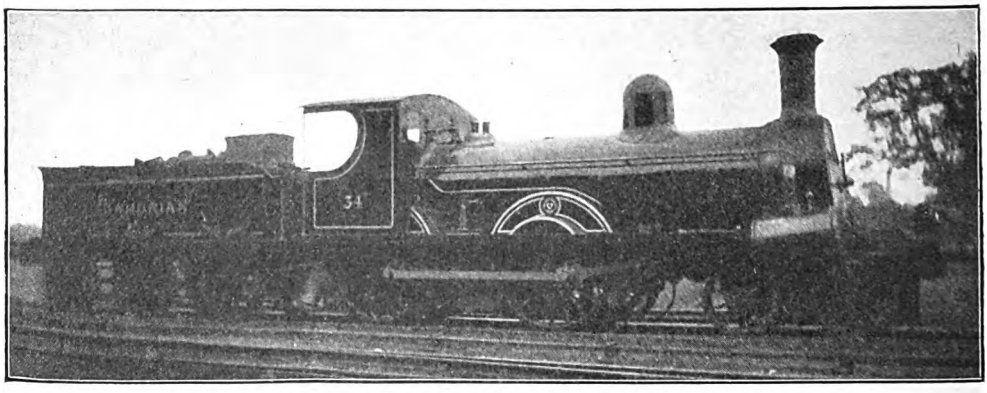
THE behaviour of the coupling-rod introduces several peculiar features. The Inspector continues: "It is at first sight difficult to understand how a rod of this description could come off the leading crank-pin, even when the washer had fallen off, if the rear washer was in its proper position, as it was in this case. But from an experiment made at Crewe it was found that a similar rod when laid on its side and fixed on one crank-pin had a deflection at its other end, due to its own weight alone, of $2\frac{5}{8}$ in., and the additional weight required to deflect the rod 6 in. at the end away from the fixed crank-pin was 3 cwt. 12 lb., so that these rods, though stiff in the vertical plane are not so very stiff laterally. Thus, when the washer of the leading crank-pin came off, with the engine running at 60 miles an hour, the rod would have a tendency to whip about like a thin metal band when held vertically and shaken, and so come off the crank-pin, and the tendency to come off would be increased when the engine was going round a left-handed curve, as it was just before the rod became disconnected. It would then fall in a facing direction and hit the ballast and become considerably bent, and sufficiently so for it to get round into the trailing position, in which it was found when the engine came to rest; but in getting round to this trailing position it must have hit a sleeper in the down line, with the result described above, and so caused the derailment of the Irish mail. If it had bent inwards instead of outwards, it would almost certainly have derailed its own engine. After hitting the sleeper in the down road, the rod became more bent, as all indentations in the ballast south of this spot were almost in the middle of the six-foot space, as described above.

"Once the split pin had come out there was nothing to prevent the screw washer gradually unscrewing and so falling off. This washer, has a right-handed screw, and if it did not revolve freely with the crank-pin, owing to friction between it and the coupling-rod, the crank-pin would naturally gradually unscrew out of the washer, as it was revolving in a right-hand direction. It was suggested at the inquiry that the screw washers on the right-hand side of the engine should be fitted with a left-handed screw, so that the tendency would be for the crank axles to screw themselves into the washer. This is a matter for experiment, and if the result is in accordance with the suggested action, it is certainly desirable to change the make."

How the Split Pin Came to be Lost.

THE Inspector continues: "It is very difficult to give any cause for the split pin working out after leaving Rugby, if it had been properly driven in and secured by splitting, as the only function of the pin is to prevent the screw washer from unscrewing off the crank-pin. Without wishing to impugn the veracity of the statements of Oldham and Elson, I cannot help thinking it possible that Oldham in his desire not to delay the train did not open the split ends as he describes, but merely bent the pin slightly when hitting it on its split end and so loosened it and slightly bent it. If this were so, then the pin picked up would correspond in its appearance to what might be expected if it were the pin put in at Rugby. If the pin picked up was not the one put in at Rugby, and if that pin was split as described by Oldham, then it probably came out by the split ends breaking off.

"I do not think Hammond can be blamed for getting Oldham to put in a pin that was got from another engine for use in an emergency, as the pins are interchangeable, being of a standard pattern, though it would have been better to have got a new pin from the shed.



CAMBRIAN RAILWAYS 4-4-0 TENDER ENGINE RESULTING FROM THE CONVERSION.

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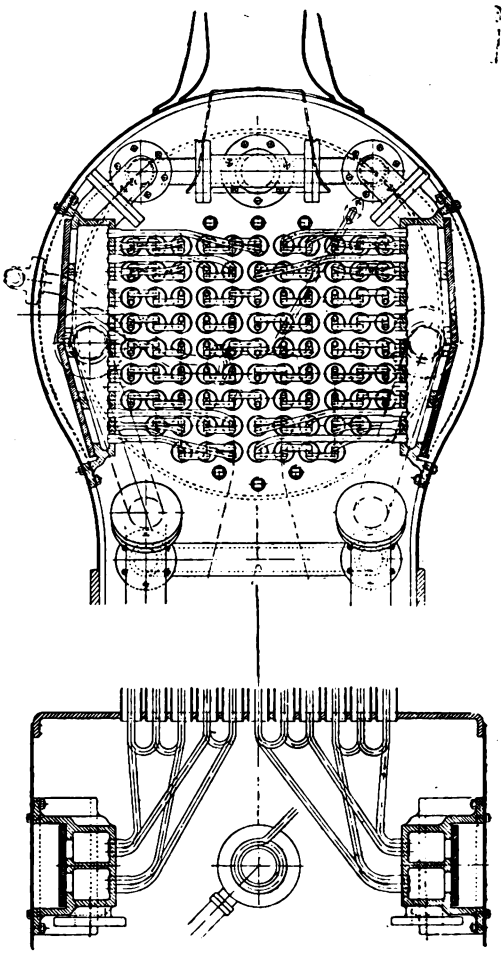
No doubt there was a desire in his mind not to delay the train. The operation of putting in these pins is a very simple one, and although the pin is usually opened by the split ends being forced apart by a chisel, there is no difficulty in doing this with the edge of the jaw of a spanner, as Oldham says he did on this occasion.

"It will be seen that all the circumstances attending this unfortunate accident were of a most unusual character, viz., the working out of the split pin, the slacking back and falling off of the washer, and the coupling-rod dropping and being bent outwards so as to damage the adjoining line. I believe this is the only case on record of an accident having occurred from this last cause."

The Robinson Superheater.

LAST month we described the new Robinson pattern of superheater in which the apparatus is adapted to fit "small" boiler tubes. A line drawing showing the apparatus in greater detail, is now reproduced. We are asked to mention that the new 2-6-0 locomotives designed by Mr. Peter Drummond for the Glasgow and South Western Railway, of the class illustrated by a photographic reproduction of No. 403, published last month, are fitted with the Robinson superheater, and not with the Schmidt superheater as stated owing to a misunderstanding. Eleven of these engines have been built by the North British Locomotive Co., Ltd.



DRAWINGS OF ROBINSON "SMALL-TUBE" SUPERHEATER AS APPLIED IN GREAT CENTRAL RAILWAY PRACTICE.

The Construction of a New Railway.

A PAPER on this subject was recently read by Mr. G. F. Moon before the Junior Institution of Engineers, and a brief synopsis will be of interest in that it summarises succinctly the comprehensive and important character of the duties involved before a new railway is commenced, and while it is being constructed. After dealing with the surveys, preparation of plans, and Parliamentary procedure, Mr. Moon pointed out that after the bill has received Royal Assent, working drawings, land plans, etc., have to be prepared. But before these are taken in hand, much outdoor work has to be done, including setting out accurately the "centre line." This "centre line" plays such an important part in the construction of the railway, that a little time spent at the beginning is well repaid during the work.

A careful inspection of the whole of the site must be made. First it is necessary to select the positions and sizes of culverts and pipes under the embankments, to take water from one side of the railway to the other, or to side ditches. Any soft or boggy places on which embankments will have to be tipped, and which are likely to give rise to slips, must then receive special attention. Such places can be drained by cutting trenches about 4 ft. wide and deep enough to obtain a good bottom, these trenches being filled in with dry stone or walling slag to 2 or 3 ft. above ground level. Thirdly, it is necessary where embankments are to be tipped on side lying ground, to ascertain whether the slope of the ground is so steep as to necessitate the cutting of benchings. The setting out of all bridges and viaducts is then put in hand, those on embankment sections first, so that they may be built, and be given as long a time as possible to set before the earthwork is tipped against them. During the erection of the fencing, a site generally alongside one of the fences is chosen on which to lay the contractors' temporary route.

Making Cuttings and Embankments.

WHERE cuttings do not exceed 6 to 9 ft. deep, they are taken out by hand; when deeper, machinery is employed. In the case of soft material, or even rock which can be blasted

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into a convenient size, a steam navvy is utilised. In good soft earth one of these machines is capable of removing 750 cubic yards of material per 10 hours day. To do the same amount of work with the human navvy, 60 would be required, and their wages would, roughly, be £12 10s. per day, whereas the approximate cost of the steam navvy amounts to about £2 per day inclusive. Another method of dealing with rock cuttings of considerable depth, is to drive a passage about 12 ft. high and 12 ft. wide on the formation level of the railway—shafts are then driven up to the surface of the ground from this heading, trucks placed under the shafts, and the excavated material allowed to fall into them. Hand drilling for blasting in a cutting of this size being too slow and too expensive, a rock drill, worked by either compressed air or steam, is used. These are extremely useful tools, for if the air-compressing machinery fails, the same machine can be operated with steam from the boiler driving the compressor, by a slight alteration of the valve packings.

There are two ways of making an embankment: first, by end tip wagons; and, secondly, by side tipping. In end-tipping, the body of the truck is hinged in front on to the axle of the leading pair of wheels. The truck when full is sent down a line of rails, which terminate abruptly on planks, so arranged that the front pair of wheels has a sudden drop of about 6 in., and are prevented from moving forward; this throws the back end of the truck up in the air, and shoots all the material out of the truck in front of it down the tip head. The method of making a side tipped bank is to lay a long tipping road on the surface of the ground, bring a train of side-tip wagons on to it, release the fastenings of the trucks, and tip them sideways by hand. Disposal of the excavated material, the methods employed in building embankments, the laying of drains, the putting down of the sleepers and rails, were fully explained. Some interesting notes were given in conclusion on the inspection of the railway by the Board of Trade, and the finishing work entailed before the engineer has completed his work.

The Opening of the Newcastle and Carlisle Railway.

A CONTRIBUTOR to the *Carlisle Journal* writes in reference to the opening of the Newcastle and Carlisle Railway, on June 18th, 1838, on the basis of a somewhat scarce little pamphlet entitled, "A Guide to the Newcastle and Carlisle Railway." A few quotations from the article may be made.

"The pamphlet is a very small affair, yet it contains some interesting information. It was surely a good augury for the success of the undertaking that the 18th of June, 1838, the anniversary of the glorious and decisive Battle of Waterloo, was the day chosen to celebrate the successful completion of what folk then considered to be a great undertaking, and that one of the engines used for the first time on that auspicious day was named *Wellington*. The work of construction was begun in 1830, amid the jeers and scepticism of a great part of the local population, and the difficulties which were thrown in the way of the directors by landowners and others who ought to have known better were really amusing.

"The first five years of construction saw the completion of the 17 miles from Blaydon to Hexham, this portion being opened on the 9th March, 1835. An additional seven and a half miles was opened on the 28th of June, 1836, and on July 19th twenty miles of the Carlisle end of the line, extending to Greenhead, was formally opened with great rejoicing. The section from Blaydon to Redheugh, four miles, was opened on the 1st March, 1837, and the remaining stretch of twelve miles, completing the whole line of rail, was opened, as I have stated, on June 18th, 1838."

Original Rolling Stock.

"THE centre panels of the first class carriages were ornamented with a crown, and the side panels with the arms of Newcastle and Carlisle. From this modest beginning the very elaborate heraldic achievement of the North Eastern Railway Company appears to me to have grown. The new engines used on that day were the *Victoria*, built by Messrs. Hawkes and Thompson of Gateshead; and the *Wellington* and the *Nelson*, by Messrs. R. and W. Hawthorn, of Newcastle. The two latter were ornamented on each side with a shield bearing portraits of the heroes of Waterloo and Trafalgar, surrounded by the emblems of war. A great number of carriages of various descriptions were temporarily fitted up for the accommodation of the thousands of individuals who were to join the procession.

"At 9.30 on this eventful morning the firing of guns announced the arrival of the *Eden* from Carlisle with six carriages containing the directors from the West and the Mayor and Corporation of Carlisle. A sumptuous breakfast at the Assembly Rooms fortified the company for the labours of the day. It was intended that the Directors and the Corporations of Newcastle, Gateshead, and Carlisle should occupy the first train, but although the doors were labelled the carriages were occupied by other parties, and it was not until half-past twelve that the trains got away."

The First Train.

"THE engine *Rapid*, without any train and displaying the Union Jack, acted as pilot. Next came the *Meteor* with four carriages and a flag on which was inscribed Nelson's motto 'England Expects Every Man to do his Duty.' In this train were the Mayor of Newcastle and his friends, and the Allenheads Band. Then followed the *Victoria* with nine carriages, the *Wellington* with nine, the *Nelson* with seven, the *Lightning* with ten and the Carlisle Band, and the *Tyne* with a steam organ and nine

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carriages. After them came the *Carlisle* with eight, the *Eden* with ten, and the *Goliath* with nineteen carriages, containing about 600 passengers. Then followed the *Atlas* with seventeen carriages, in which were the Newcastle and Northumberland Volunteers' Band; next the *Samson* with eleven carriages.

"In this train were very few passengers, but it was succeeded by the *Newcastle* with nine carriages well filled, and a flag inscribed 'Prosperity to Newcastle.' Last of all came the *Hercules* with eight carriages. The aggregate number of passengers, upon a fair computation, exceeded 3,500. The procession, previous to starting, reached nearly half a mile, but when in motion it was not less than a mile and a half, allowing as much space between each train as was consistent with safety."

The writer of the article in the *Carlisle Journal* concludes by remarking that he has heard old folk who remembered this opening speak of the great excitement it occasioned, and how numbers of parents with their children spent the whole day seated on the embankments for the purpose of watching the trains pass.

Relaying on American Railways.

REFERRING to the article on "The Relaying of Permanent Way," by Mr. Jenkinson, published in RAILWAY MAGAZINE, May, 1915, Mr. W. G. Landon writes concerning methods in vogue in America:—"The ballast and sleepers are not interfered with. Rails and fish plates are deposited along the right of way. The rails are then placed in the 4 ft. and a 1,000 ft. or more joined up. Then on Sunday, at a time when there is little traffic for a considerable time, the spikes are withdrawn from the outside of one line of rails for a 1,000 ft. and that length of rail tipped out by 200 men with bars. The new rail is then prised into position and spikes driven in on the outside. Often 500 to 1,000 men are employed and three or four sections of a 1,000 ft. are done at once, one line of rails only, the other side being tackled after a mile or so of new rail has been put in on one side. This, of course, when the new rail is of the same section as the old. Otherwise both sides must be done at once and out of the four rows of spikes three must be removed instead of two. The extremes of temperature are much greater in America (this accounts for the use of short rails, 33 ft. being standard), so that the gap left between rails is varied according to the thermometer. When the temperature is 100° or over the rails are laid snug; if a gap were left, an undue number of fishplates would be broken in winter by the tension set up by contraction.

"Of the two methods the American is undoubtedly the cheaper. It saves relining of the track, which on curves involves considerable labour. Traffic can be resumed at short notice, and when relaying is finished the track is suitable for high speed immediately. The sleepers are used for their full length of life without transferring. They are removed only when unfit for further service. Old sleepers are burned in piles on the spot. Apparently cost of removal is more than their worth. American construction cannot now be called inferior to British. Each sleeper has a couple of steel plates to carry the rails. The fishplates are usually of the six-bolt type supported on three sleepers, so that sagging at the joint is much less than with the suspended joint."

Stop, Look and Listen.

THIS well-known phrase is common parlance in America, and has equivalents in other countries where highway crossings of railway tracks are not safeguarded by gates under the control of signalmen or gatekeepers as in the United Kingdom. Insistence upon the fact that this injunction is to be seriously obeyed is a strong feature of the "Safety First" movement in America and in conjunction therewith we may refer to a notable sign exhibited by the Long Island Railway.

A pamphlet issued under the auspices of the Pennsylvania Railroad system and associated lines, points out that the Long Island Railroad has a grade crossing proposition to deal with that is unlike any other. Despite the fact that it has eliminated 305 crossings, a large number of which are within the limits of New York City, there still remain 631 places where the railroad crosses highways at grade. Possibly the crossings would not be such a source of trouble if Long Island was not a great summer playground. Every Sunday and on holidays it is thronged with pleasure seekers, no small number of whom travel in automobiles.

As long as these people, pleasure seekers and others, stop before driving over the railroad crossings on Long Island they are safe from accident at those crossings, but when they disregard all warning signs, gates and watchmen, and drive over the railroad tracks at breakneck speed—and not infrequently through crossing gates let down to warn them of an approaching train—they endanger their lives, the lives of the people on the trains, and, incidentally, cause the railroad great trouble and heavy expense—entirely apart from the cost of renewing the gates which they smash into splinters.

In the attempt to induce due observance of the injunction to "Stop, Look and Listen," the sign referred to has been erected on the railroad bridge at Broadway, Flushing, over the main highway leading to the north shore of Long Island. This sign is 60 ft. long and 20 ft. high. The wording was adopted as being sufficiently out of the ordinary to make it fairly certain that people would read it, and is as follows:

"THIS SIGN MAY SAVE YOUR LIFE TO-DAY.
All The Precautions In The World Will Not Save The Lives Of Those Who Drive Automobiles Recklessly Over Railroad Crossings.

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When Approaching A Crossing Please *Stop, Look* and *Listen.*
We Are Doing Our Part. Won't You Do Yours ?
Long Island Railroad."

In reference to the above we may also quote a verse published recently in the *New York American*, the writer being James Montague. It reads thus :

"There was a man who fancied
That by driving good and fast
He'd get his car across the track
Before the train came past.
He'd miss the engine by an inch,
And make the train hands sore.
There *was* a man who fancied this ;
There isn't any more."

The Most Powerful Locomotive.

SEVERAL problems are continually being presented in various guises for solution by the Editor. Of these, two of the most usual are : "Which is the most powerful locomotive in the United Kingdom ?" or a companion query as to speed capability. Neither of these permits of a decided answer. Indeed, before they can be replied to it is necessary to specify a basis of comparison—well nigh an impossibility, as a little thought will show.

In mechanics—and the practice is growing in other fields—it is usual to employ composite terms to express something which is indeterminate without a second factor. Thus we get "foot-pounds" as a measure of power or force involved in the movement of a given load through a given vertical distance. Similarly we have ton-miles, feet per second, and other composite terms, all adopted on the principle that one factor alone is meaningless without another. In fact, sometimes three or more factors are required before any very definite statement can be made ; and the queries referred to afford a good example of the complicated character which even an apparently simple question takes as soon as it is critically considered. What is the power of a locomotive ? Is it the maximum load an engine can haul ? If so, on what grades, at what speeds, under what conditions, and subject to what hindrances and special factors ? Is it speed capacity ? But speed, *per se*, is quite a secondary matter. A light engine should be able to put all its power into speed ; but it is well-known that a light engine, and often a very light train, is unsafe at high speed, or, at any rate, must be driven very carefully. Presumably, correspondents who raise this query have in mind the working of heavy trains over difficult roads at high average speeds ; but how are fair comparisons to be made ?

Horse-power and draw-bar pull.

By selecting horse-power as a basis, one combines load, distance and time ; but no regard is had to the circumstances under which the work is done—in locomotive train working an exceedingly important matter. The fact is that there can be no decided answers to such queries. The tractive power formula allows of combining cylinder dimensions, steam pressure and coupled wheel diameter ; while other formulæ include further factors. But all of them come down to fuel consumption per unit of power, qualified by the most variable factors of all—speed, effect of grades, weather, and the way the engine is managed. Drawbar pull shows the maximum tractive force applied to the train—a measure of power which can only be ascertained in special trials and then usually as a special effort. But in practice small engines will often do wonders —at the expense of fuel consumption, or as the result of clever manipulation—and big engines are adapted to their particular work, which varies on each line, so that comparison is virtually impossible. One can say that a particular engine is the heaviest, or has the largest cylinders, or the highest steam pressure ; and occasionally one can say that such and such an engine has exerted a particular drawbar pull, whereas another has only done so-and-so ; but beyond that it is impossible to go with any degree of exactness.

In the same way, speed is largely a matter of particular performances. On most railways there are usually certain specially hard or notable schedules ; but most of these are worked by various classes of engines on occasions, while it is fairly correct to say that downhill any engine can run at any practicable speed if it is allowed to do so, and its design and the lay-out of the line renders this safe. Uphill speed is in some respects a measure of what can be done, but in practice becomes rather a matter of what is attempted and how the enginemen manipulate the engine to that end.

A Relic of Early "Railway Projection" Days.

A STRAIGHT line is defined as "the shortest distance between any two points," and many of the early projects for the construction of railways appear to have been based upon this definition, with little regard to the actual geography of the country. Mr. Henry A. Warriner, of Shipston-on-Stour, one of our numerous "Readers from No. 1," sends a copy of an old lithograph found among the papers of his uncle, the late Mr. Henry Warriner, who in 1850, and for some years after, was in the employ of the London and North Western Railway, and for nearly 45 years was manager for Messrs. Maudsley, Sons & Field, the well-known marine engineers. Mr. Warriner mentions that he remembers his uncle referring to his early work as a skilled millwright for Messrs. Braithwaite & Mitner's, in Bath Place, near Euston, and which involved his being concerned, on the night of June 3rd, 1838, in altering some defective pumps on engines which had come from the north (from Tayleurs', of Warrington) for the purpose of opening the Great Western Railway, on June 4th, 1838.

The enclosure for which we are now indebted to Mr. Warriner is a lithograph of a diagram and

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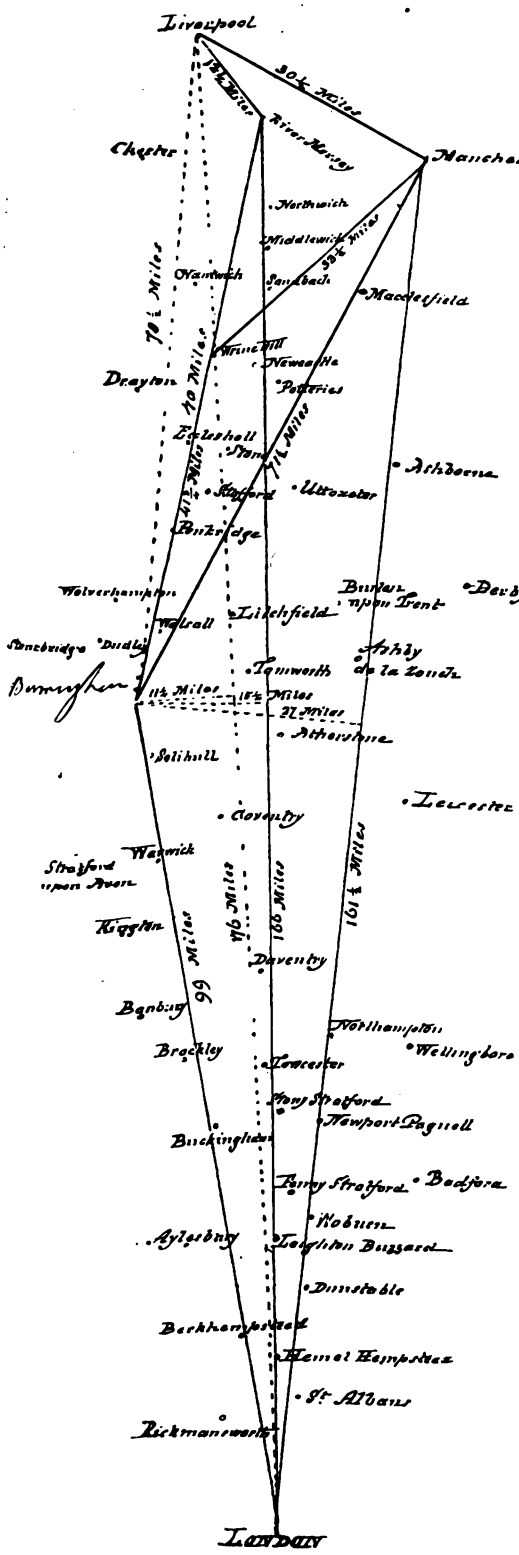

A RELIC OF EARLY "RAILWAY PROJECTION" DAYS.

table for proposed lines from London to Liverpool, and seems to have been drawn by Mr. J. W. Rastrick, one of the early railway engineers. The water mark is 1829, the year when Mr. Rastrick was advising the Directors of the Liverpool and Manchester Railway as to their motive power for the future. It is reproduced on this page. Several analyses are appended, as follows :—

	Miles.
London to Birmingham	99
Direct line, Birmingham to Liverpool ..	78½
	177½
Direct line, London to Liverpool ..	176
Difference	1½
London to Birmingham	99
Birmingham to the River Mersey ..	70
River Mersey to Liverpool	12¼
	181¼
Direct line from London to the Mersey ..	166
River Mersey to Liverpool	12¼
	178¼
Difference	3
London to Birmingham	99
Birmingham to Wrine Hill	41¾
Wrine Hill to Manchester	33½
	174¼
Direct line from London to Manchester ..	161½
Difference	12¾
London to Birmingham	99
Direct line from Birmingham to Manchester	71½
	170½
Direct line, London to Manchester ..	161½
Difference	9
Direct line from Manchester to Liverpool	30½

Mr. Warriner points out that no one has yet travelled from London to Birmingham in 99 miles. The original return of the London and Birmingham Railway shows that from the Regent's Canal at Camden Town to Nova Scotia Gardens in Birmingham—one mile short of each present terminus—was over 111 miles on that survey. Mr. Rastrick's diagram and tables are of interest as showing some of the early ideas which were held, though the project is "without form and void," as to the best ways of going from London to the North-West. It also seems to suggest that the principal requisites of some of these early railway engineers, even those whose names have become historic, were often merely a map, a pair of dividers, a scale of miles, and the ability to perform easy addition or subtraction sums. At any rate, until "paper" projects had to be realised.

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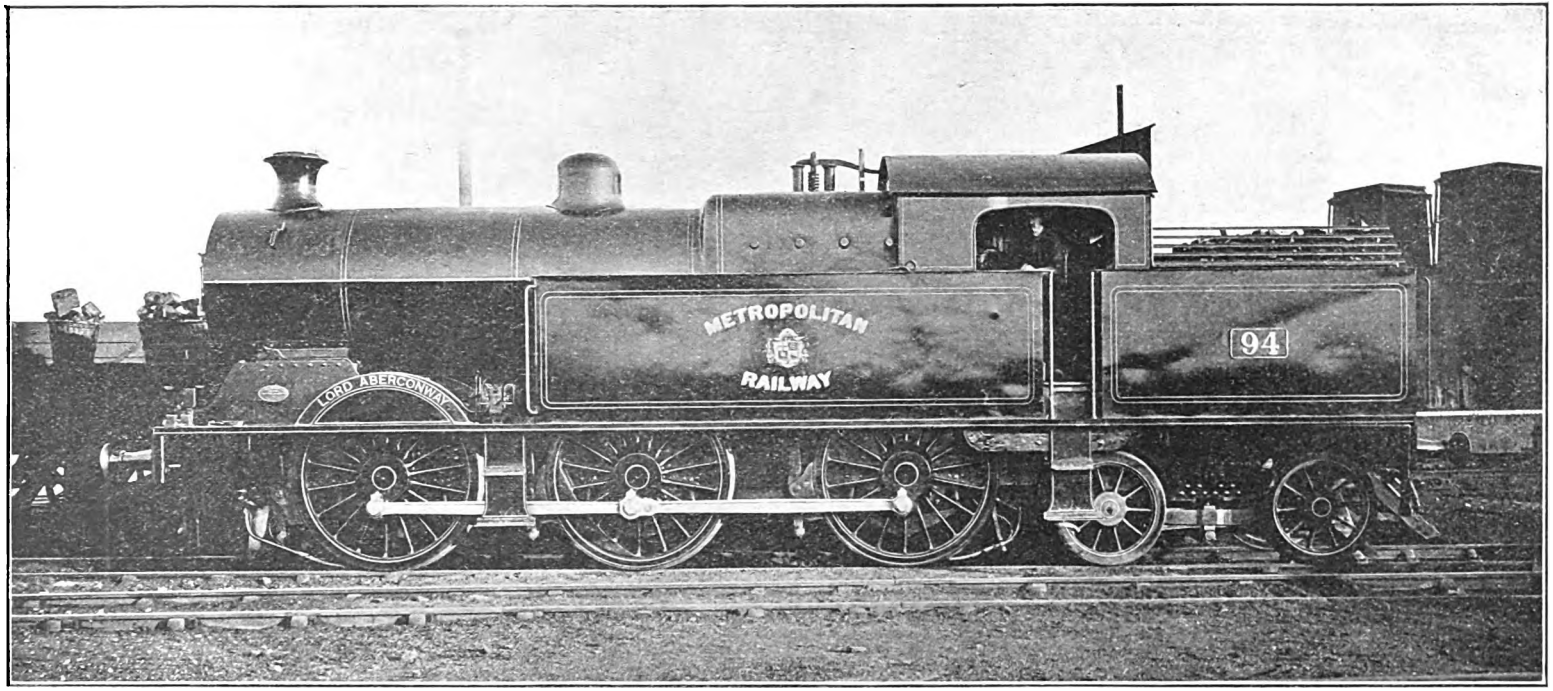

0-6-4 TANK ENGINE No. 94, "LORD ABERCONWAY": METROPOLITAN RAILWAY.

DURING late years the Metropolitan Railway has shown great energy in catering for the traffic in the districts on their Extension Line, aptly described as "Metro-land," and in connection with this progress they have recently brought into traffic working the first of their new steam locomotives, which has just been delivered, although ordered some time prior to the war. This engine, which bears the name of the Chairman of the Company, Lord Aberconway, inaugurates a new class designed to enable the Company to accelerate journey times, and thus further improve the notable traffic facilities already in operation. With this design another railway is added to the extending list of those using the 0-6-4 wheel arrangement, while the engine is the first on the Metropolitan Railway to be equipped with superheating apparatus.

LEADING DIMENSIONS.

Cylinders	20 in. by 26 in.
Diameter of driving wheels	5 ft. 9 in.
Diameter of trailing wheels	3 ft. 6 in.
Total wheelbase	28 ft. 9 in.
Length over buffers	41 ft. 2 in.
Working pressure	160 lbs. per sq. in.
Grate area	21·4 sq. ft.
Capacity of water tanks	2,000 gallons.
Coal capacity	4½ tons.
Weight in working order	73 tons.
Heating Surface—Tubes	1,046 sq. ft.
Firebox	132 "
Superheater (Robinson type)	268 "
Total	1,446 "

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Bogie "Singles" on the Great Western Railway.

Mr. E. Little, of Bicester, writes as follows: "It may be of interest to your numerous readers to learn that, of the erstwhile famous 7 ft. 8 in. bogie singles on the Great Western Railway, at the time of writing only two remain in traffic, these being No. 3050 *Royal Sovereign*, and 3074 (nameless) stationed at Worcester and Taunton respectively. Both these engines carry the last pattern of boiler designed for the class, having an extended smokebox, large painted dome cover, Belpaire firebox, top feed apparatus, and large cab. No. 3050, I learn, has for some time past been working in a link from Worcester to Leamington *via* Stratford-on-Avon, returning home by Birmingham and Stourbridge Junction, and has in consequence not visited Oxford or Paddington for some six months. She has been almost regularly in the hands of Engineman Ballard, a well known figure on the single engines working between Worcester and London, who is just about to retire from the Company's service.

"It may not be generally known that the Worcester 4–2–2 engines (and the Oxford ones also) between the years 1909 and 1914 had to tackle some very heavy loads between Oxford and Paddington or *vice versâ*, trains of 11, 12, and 13 eights being no unusual sight, and I never remember seeing a pilot attached to the singles when heavily loaded. With such trains I have known the Worcester or Oxford men pass Radley (5 miles) in 8¼ to 9 min. from the dead start at Oxford platform—performances which clearly indicated that the handling of a single-wheel engine is indeed a fine art."

Locomotive Practice and Performance on the Great Indian Peninsula Railway.

It is not often that we are able to deal in detail with trains running on Indian railways, therefore a few notes based on a letter from one of our readers, Mr. F. M. G. Burton, of Agra, will be of value. He deals specifically with two runs, "the best he could find in his diary." The more remarkable of the two was with the up weekly express mail on the Great Indian Peninsula Railway, run to meet the outgoing P. and O. mail boat for Europe. This run was made in 1907. Mr. Burton thus describes his journey:

"The North Western Railway Punjab mail from Peshawar arrived very late and hence we had a late start of about six or seven hours. At exactly 16.55 we left Delhi. We had four bogies. There were in all 31 passengers (only first class passengers and their servants are allowed in this train). All of these were bound for England, including myself. The weather seemed favourable. Drivers in each section tried their best to make up time and had put in such an excellent record, that within these last eight years, I have travelled no less than two dozen times every year, with the fastest scheduled trains in this country, but have failed to witness a run better than this, and not even a run of this type. From Delhi to Itarsi we had single line for a distance of 493 miles and so we had to slow down at each and every *Run Through* station to pick up line clear ticket. On this section the running was very creditable, occupying about 11½ hours. After leaving Itarsi, we had double line right through to the Victoria Terminus, Bombay, a distance of 464 miles, which was covered in just a little above nine hours. At times we were running at 55 miles an hour for 15 and 20 miles on end, at others, on steep declines, at 70 and 80 miles per hour for 8 and 10 miles, without lowering speed. At a place near Chandui station, between Khandwa and Bhusawal, we covered 5 miles in 3 min. 28 sec.—86 miles an hour."

Exceptional work with a native driver.

"After coming into Bhusawal, we attached a big 4–6–0 locomotive, No. 234, driver Eduljee Manekjee (an old Parsee). From Itarsi to Bhusawal we had No. 155 (4–4–0), driver Eduljee Cawarjee (also an old Parsee). The latter made some remarkable running, but it was with No. 234 that the most exceptional work was done. Considering the gradients involved, even with a light load, driver Eduljee Manekjee did remarkably to achieve a non-stop run from Bhusawal to Maumad, 114 miles, in 121 minutes. After leaving Maumad and passing the summit bank, our driver put on full steam down the bank, reaching a speed of no less than 90 miles an hour. We passed Niphad station at an excessive speed and I do not hesitate to say, that this was the most excellent performance ever done on Indian soil. I do not know of any better run than this one. I am inclined to compare the Indian runs with our British performances and then even, I say, that we English have done no better runs than what this Parsee driver did.

"At Kasara we had an Atlantic engine attached to our train. Though driver Diar put in a good performance, he could not reach the high standard of Eduljee Manekjee. Eventually we reached Victoria Terminus, Bombay, Platform No. 6, at exactly 13.48, just in time to catch the P. and O. boat, which sailed away at 15.5, twenty-six minutes late from Bombay."

Some comparisons.

Mr. Burton sends detailed particulars of this run, but we can only refer to them in outline. In the case of the 1907 run with the P. and O. mail express the stages were as follows: 4–4–0 engine No. 74, driver R. Naorojee, Delhi–Mutra (89 miles, 112 min.); Mutra–Agra (33 miles, 40 min.); Agra–Gwalior (73 miles, 115 min.); Gwalior–Jhansi (61 miles, 77 min.). 4–4–0 engine No. 78, driver Fitzgerald, Jhansi–Bina (95 miles, 115 min.); Bina–Bhopal (86 miles, 119 min.); Bhopal–Itarsi (56 miles, 77 min.) These times were made over long single-track stages as mentioned. Engine No. 155 (4–4–0), driver Eduljee Cawarjee, Itarsi–Harda (48 miles, 52 min.); Harda–Khandwa (63 miles, 75 min.); Khandwa–Bhusawal (77 miles, 84 min.). Engine

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No. 234 (4–6–0), driver Eduljee Manekjee, Bhusawal–Chalisgaor (pass) (72 miles, 72 min.); Chalisgaor–Maumad (42 miles, 48 min.); Maumad–Igatpuri (77 miles, 80 min.) Ghât engine No. 333, driver Calligan, Igatpuri–Thul Ghât reversing station (7 miles, 18 min.); thence to Kasara (3 miles, 10 min.) Engine No. 938 (4–4–2), driver Peter Diar, Kasara–Bombay (75 miles, 75 min.).

The second run to which Mr. Burton refers was made in 1915. The train was 3 hr. 45 min. late from Delhi, as the North Western Railway mail arrived late from Peshawar. But when entering Bombay the train was only 5 min. late in. Load was 7 bogies. There were rather more stops. From Delhi to Jhansi, with a 4–4–0 engine, driver Hutchinson, the 256 miles occupied 6 hr. 37 min., with five stops, aggregating 38 min. Thence to Itarsi (237 miles), 6 hr. 17 min. were occupied by another 4–4–0 engine, driver Rustomjee, with five stops aggregating 41 min. From Itarsi to Bhusawal, driver Rustomjee Cawarjee (4–4–2 engine), the 188 miles took 3 hr. 56 min., with two stops representing 24 min. spent at stations. A superheater 4–6–0 engine, driver Weber, worked the train from Bhusawal to Igatpuri, 191 miles, in 4 hr. 33 min., with two stops accounting for 25 min.; a Ghât engine was employed thence to Kasara, and the final stage of 75 miles to Bombay, driver Fidgett (4–4–2), occupied 97 min., with one stop of four minutes.

Old Locomotives still on Heavy Main Line Traffic.

Until quite recent years it was by no means uncommon to find principal London and North Western Railway express trains worked by two of the old "Precedent" locomotives, especially, and somewhat paradoxically, on the hardest section between Crewe and Carlisle. Such occurrences are now much more uncommon, and therefore the following letter from a Crewe reader is worthy of publication:—

"As a regular subscriber to your excellent periodical, I think it may be of interest to you to know that to-day I saw the Perth and Aberdeen portion of the 2 p.m. from Euston leave Crewe for Carlisle with two old 2–4–0 engines, the pilot dated 1864 (July) and the train engine 1876. To my great regret, after the train had left, I realised that I had omitted to note either the numbers of the locomotives or the number of coaches on the train, but it seemed an average load (for modern London and North Western Railway expresses) of bogie corridor coaches and one dining saloon. Surely 51 years is almost a record age for an engine engaged in first-class express work with the heavy loads and gradients characteristic of the London and North Western."

Photo] [*D. S. Walsh.*

A.S.C. MEN LOADING RAILWAY TRUCKS AT MARLBOROUGH, GREAT WESTERN RAILWAY.

"Natural History" and Railway Mishaps.

It is well-known that birds, insects and animals can, and occasionally do, cause special difficulties on railways, and our Great Western contemporary refers to three instances which may be quoted: "An extraordinary and lamentable accident occurred recently to the fireman on the engine of the 8.18 p.m. passenger train from Cardiff to Fishguard. After passing Peterstone station, while looking out through the engine spectacle glass for signals, an owl flew against the glass and broke it, causing a piece of glass to enter the fireman's eye. The train was quickly stopped, medical attendance secured, and later the man was removed to the hospital. The injury, however, was so serious that the unfortunate victim of this singular occurrence has lost the sight of one eye, and the sight of the other is jeopardised. A short

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delay from a most exceptional cause occurred to the 10.20 a.m. passenger train from Paddington to Worcester on June 27th. When the train was near Pangbourne a rook flew against the front of the engine, striking the pipe of the vacuum brake and causing the pipe to become detached from the plug. This admitted air to the brake pipes, caused the brakes to be applied, thus stopping the train. At Cardiff station, on May 11th, the 8.45 a.m. express Paddington to Carmarthen, was delayed 4 min., owing to a swarm of bees on the platform hampering the railwaymen's operations."

The "Liberty Bell" Special.

SPECIAL trains are and have been operated for a wide variety of purposes, and in the United States it is quite usual for such trains to be arranged under conditions which have no parallel in Great Britain. The "Liberty Bell" Special introduces a new phase, and we are indebted to the Pennsylvania Railroad for particulars of arrangements made for what is the longest journey so far made by the bell, which is one of America's choicest national possessions.

The occasion was the sending of the bell to the Panama-Pacific Exposition. It was shown in 1884 at the World's Industrial and Cotton Exposition in New Orleans; in 1893 at the World's Fair in Chicago; in 1895 at the Cotton States and International Exposition, Atlanta; in 1902 at Charleston; in 1903 at Boston for the celebration of the 128th anniversary of the Battle of Bunker Hill; and in 1904 at the World's Fair in St. Louis.

The tour to San Francisco involved journeys through fifteen States, in two crossings of the Republic. For the transit a specially-constructed car has been built, worked as part of a special train, furnished by the Pennsylvania Railroad, and in charge of the Company's representatives throughout the entire journey. All arrangements for running the "Liberty Bell" Special over the lines of other railroads, from the end of the Pennsylvania's lines at Chicago to San Francisco, were made by the Pennsylvania Railroad and approved by a City Council's Committee.

Every precaution was taken for the safety of the bell. To avoid the shocks and jolts of travel and to eliminate vibration as completely as possible, the big steel "gondola" car upon which the bell rested was equipped with specially-designed steel springs adjusted to the exact load they are to bear. These measures were important owing to the necessity for protecting the famed relic against jars that might widen the ever-increasing crack in its side. The "Liberty Bell" Special was operated on a schedule which provides for a speed at no time greater than 35 miles per hour. The bell was suspended in the centre of its car from a frame of seasoned ash. Surmounting the frame was the inscription "1776—Proclaim Liberty." The car itself was painted a bright red and a brass railing was built around its edge for the convenience and protection of its guard of four Philadelphia policemen.

In order to enable people near whose homes the bell passed at night to see it, the car was brightly illuminated electrically. The "Liberty Bell" Special included besides the bell car, a steel baggage car, a steel diner, two steel sleepers, and a steel private car, "Philadelphia." The official escort of the "Liberty Bell" on this journey included the Hon. Rudolph Blankenburg, Mayor of Philadelphia; and a Committee of Councils of the City of Philadelphia, together with a number of city officials and others, besides four "Guardians of the Bell." Before leaving for the Panama-Pacific Exposition the "Liberty Bell" was the centre of a celebration in Philadelphia, and 3,000 soldiers acted as escort on the way to the Pennsylvania Railroad freight yard in West Philadelphia.

Railway Literature for H.M. Forces.

FROM The Hague a Dutch reader has sent a remittance for RAILWAY MAGAZINES to be given to British soldiers, and the publishers have carried out his request by handing the copies in at Fleet Street Post Office, London, for free distribution under the facilities afforded by H.M. Postmaster General.

Any oversea subscribers desiring to emulate this example may rely upon the best possible use being made of their money. The publishers are likewise willing to act as agents for British and Irish readers who wish to avail themselves of the scheme, but may be living in places remote from booksellers' shops or railway bookstalls, or who, for some reason, find inconvenience in forwarding the magazines. Further, the publishers will gladly add 50 per cent. to the value of all remittances received for the purpose mentioned.

It should be remembered that in addition to many thousands of soldiers and sailors keenly interested in railway subjects as a hobby there are over 100,000 men in the fighting forces who in civil life were railwaymen. All these brave fellows would enjoy perusing the monthly issues of the RAILWAY MAGAZINE in trench, field or hospital, and readers can do much to assist the publishers in meeting the demand.

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WHAT THE RAILWAYS ARE DOING

Up to November 5th, the London and North Western Railway had furnished 16,991 men as their contribution to the fighting forces of the nation, or 18 per cent. of the total of employés. Additions to the already long list of men singled out for distinguished conduct, etc., are: E. Matthews, private, 2nd Battalion South Wales Borderers, head shunter, traffic department, Aston, awarded the D.C.M. for conspicuous gallantry on the Gallipoli Peninsula, June 18–19th, 1915; J. J. Towers, bombardier, 22nd Trench Howitzer Battery, R.G.A., checker, goods department, Broad Street, awarded D.C.M. for conspicuous gallantry and devotion to duty in the operations to the north of Ypres; A. F. Behrend, 2nd lieutenant, 4th Battalion East Lancashire Regiment, probationer, traffic department, Liverpool, mentioned in despatch of August 26th, 1915; W. Hayes, private, 7th Battalion Manchester Regiment, fireman, locomotive department, Longsight, commended by the commander of his division for gallantry; A. Mason, private, 5th Battalion Royal Inniskilling Fusiliers, porter, goods department, Park Lane, Liverpool, commended by the commander of his division for distinguished conduct in the field; W. Mason, gunner, 104th Battery, R.F.A., labourer, carriage department, Wolverton, commended by the commander of his division for conspicuous bravery in the field. Private E. Matthews lost his life in action June 28th, 1915.

* * *

There has been opened at York station a soldiers' and sailors' buffet for the use of service men. The buffet is the result of the efforts of a committee of ladies who have undertaken to provide light refreshments at low charges to men in uniform. The buffet is kept open night and day by relays of lady volunteers. In addition to the fixed buffet, which faces the south main platform, there is a service at distant platforms by means of wheeled buffets. The North Eastern Railway provided the accommodation by converting two old railway vehicles—a saloon and a van. The saloon forms an ideal buffet, while the van has been turned into a kitchen and retiring-room. Arrangements for the supply of refreshments to service men have been made by local committees at other places on the North Eastern Railway, Selby, Leeds, Monk Fryston, Church Fenton, etc.

* * *

Employes of the Midland Railway carriage and wagon painting department, Derby, recently attended the unveiling of a Roll of Honour in the paint shop. About 100 men have gone from the department, and of this number six have laid down their lives. To perpetuate the memory of those who will not return it was decided to erect a permanent "Roll of Honour" in the shop, to their memory. It takes the form of a work of art, designed and executed by Mr. J. H. Allgood (engaged in the department), painted on a panel. The "Roll" had the following names inscribed upon it: Arthur Stevens, Harry Wollacott, William Burnett, John Arthur Hands, and William Humber. Another name to be inscribed is that of Henry Luck. The memorial is surmounted by the crown, round which twines the flags of the Allies, and bears the Derby and Midland Railway coats of arms, together with pictures showing respectively a naval action and a battle scene. The inscription reads: "Dedicated to our shopmates, who gave their lives for King and Country in the Great War, 1914 ——."

* * *

The Directors of the North British Railway have agreed that local privilege tickets will be granted under the existing arrangements to the widows of deceased servants who had a continuous service of not less than twenty years, and who, at the time of their decease, were either in the service or in receipt of a pension from the Superannuation Fund, the North British Railway Insurance Society, for from the Company, as long as they remain widows, and also to their children who are permanently resident with and dependent on them. An arrangement has likewise been made whereby local privilege tickets will be granted to the widows of servants on the permanent staff called up, or accepting service, with the Colours, with the consent of the head of their departments, who have been, or may be, killed in action or who may die from wounds, or from any other cause while on service with the Colours during the current war. This arrangement applies to all such widows in cases where the deceased servant's length of service was not less than four weeks, and will be continued during the pleasure of the Directors, but for no longer period than five years from the date of the servant's death.

* * *

To the fish trade and others concerned, the East Coast, West Coast, and Midland Railways have given notice that, in consequence of the shortage of staff, and other difficulties, the fish traffic from Aberdeen and stations on the Great

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North of Scotland Railway, from stations on the Highland line, and from Montrose, Arbroath, and Dundee hitherto conveyed by the 1.45 p.m. North British, and the 2 p.m. Caledonian fish trains from Aberdeen and trains in connection therewith, is now despatched and conveyed by one train for alternate periods of two months by the West Coast and East Coast routes respectively. For the first two months, viz., December, 1915, and January, 1916, the traffic is conveyed by the West Coast route, and during the next two months, viz., February and March, 1916, it will be dealt with by the East Coast route, leaving Aberdeen at 1.50 p.m. from Mondays to Fridays inclusive, and from other points by connecting trains. Thereafter in alternating periods of two months till further notice. The 1.45 p.m. East Coast fish train from Aberdeen to London will not be run on Saturdays; and traffic for Ireland is conveyed by the 1.10 p.m. Caledonian train from Aberdeen *viâ* Holyhead.

* * *

THE retirement of Mr. A. G. Reid, from the position of General Manager and Secretary, Dublin and South Eastern Railway, is announced. He entered railway service in 1862 as booking clerk at Heaton Norris, London and North Western Railway. After some years he joined the North Eastern Railway, and eventually was appointed to the charge of the Mineral Department at Tyne Dock. After holding that position for seven or eight years, Mr. Reid became Passenger Superintendent, Great North of Scotland Railway, and held that post for nearly 20 years. In February, 1900, he was appointed General Manager of the Dublin, Wicklow and Wexford Railway (now Dublin and South Eastern Railway), and in 1913 became Secretary to the company as well as General Manager. Mr. Reid was Chairman of the Superintendents' Conference in 1890, and of the Irish Managers' Conference in 1910. The Directors have appointed Mr. R. D. Griffith, secretary, in succession to Mr. A. G. Reid, who formerly combined the offices of General Manager and Secretary.

* * *

MR. THOMAS CHEW, who now succeeds Mr. Edward Moore as Solicitor to the Great Eastern Railway Company, has been Assistant Solicitor to the Great Eastern Railway since 1907. He was articled to a City firm of solicitors, and after being admitted as a solicitor was for several years engaged in general practice. In 1888 he entered the service of the Great Eastern, taking charge of the Common Law business of the solicitor's department, and since being appointed Assistant Solicitor he has been occupied on the work of all branches of that department, and latterly with the Parliamentary business of the Company. In 1909 Mr. Chew was entrusted with the conduct of the Company's case before the Arbitrator, Lord Gorell, on the subject of wages and hours, the arbitration proceedings lasting eleven days, and involving a large number of witnesses and statistical and other evidence. Since 1907 Mr. Chew has enjoyed the complimentary position of honorary solicitor to the Railway Rating Surveyors' Association.

* * *

RETIREMENT is announced of Mr. William Knox Laurence, M.I.C.E., after forty-seven years' service with the Great Western Railway, of which between twenty-two and twenty-three have been as Divisional Engineer, first at Reading, later at Paddington, and since November, 1896, at Bristol. He is succeeded by Mr. Henry Richard Kemp Woodward, M.I.C.E., Divisional Engineer at Shrewsbury. Mr. Robert Cherry Sikes, M.I.C.E., chief assistant in the Divisional Engineer's office at Bristol, succeeds Mr. Woodward as Divisional Engineer at Shrewsbury; and Mr. Harold Reid, M.I.C.E., follows Mr. Sikes as chief assistant to the Divisional Engineer at Bristol. Mr. Reid has been attached to the staff of the New Works Engineer, Mr. W. Y. Armstrong, and since September, 1908, has acted as Resident Engineer in charge of the construction of the Birmingham Moor Street goods and passenger stations, and also the widening of the viaduct from Bordesley to Moor Street, Birmingham.

* * *

MR. HENRY ELLEN, Chief Clerk to Mr. Godfrey Knight, Secretary, London and South Western Railway, has retired after a service of forty-four years, mostly spent in the secretary's office. A presentation from colleagues and friends was made by the secretary (Mr. Godfrey Knight) at Waterloo station. Mr. Buckmaster (General Manager's Department), Mr. Johns (Engineer's Department), and Mr. Walter (Transfer Department), also spoke for their respective departments. Ellen replied, thanking the donors for their kind thoughts.

* * *

MR. EDWARD MOORE, who has retired from the office of Solicitor of the Great Eastern Railway recently, was invited to lunch at the Liverpool Street Hotel by the Chief and District Officers of the line. The Chairman, Lord Claud Hamilton, and Deputy Chairman, the Right Hon. Sir Ailwyn E. Fellowes, were present. Mr. Moore was presented with an illuminated address on parchment, contained in an inlaid rosewood case, expressing the good wishes of his late colleagues and asking his acceptance of the following gifts: A gold repeater watch, gold cigarette case, silver tea service, silver waiter and silver cigarette cabinet. The presentation was made by Mr. H. W. Thornton, General Manager.

* * *

THE *Médaille Militaire*, the distinguished service French decoration, has been presented to a Sheffield Midland Railway porter, Pte. W. Marchant, of the R.A.M.C., serving with the Lahore Casualty Clearing Station, Lahore Division, Indian Expeditionary Force in France. When called up as a reservist at the outbreak of war, he was engaged as a goods porter at Heeley station. The *Médaille Militaire*, which was

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instituted by Napoleon III., is conferred only for naval and military services in war time, and is limited to privates, non-commissioned officers, and generals.

* * *

ANOTHER Sheffielder, Sergt. William Brooks, of the 1/3rd West Riding (Sheffield) Field Ambulance (R.A.M.C.), who previous to joining the Army worked for Messrs. Cammell, Laird & Co., Sheffield, has also been presented with the French *Mèdaille Militaire* for conspicuous bravery.

* * *

SHED plates indicating the depôts to which engines belong are now used by nearly all leading railways, the latest addition being the South Eastern and Chatham Railway. Plates are being placed inside the cabs of these engines on the following systems: Longhedge, 1; Bricklayers' Arms, 2; Cannon Street, 3; Slades Green, 4; Tonbridge, 5; Ashford, 6; Orpington, 7; Purley, 8; Redhill, 9; Strood and New Brompton, 10; Deal, 11; Hastings, 12; Ramsgate, 13; Margate West, 14; Maidstone East, 15; Maidstone West, 16; Faversham, 17; Reading, 18.

* * *

H.M. armed boarding steamer *Tara*, recently reported sunk in the Mediterranean by enemy submarines, was formerly the London and North Western passenger steamer *Hibernia*, used for the Kingstown-Holyhead service. A few days later another London and North Western Railway steamer was lost, the *Anglia*, serving as a hospital ship, striking a mine in the Channel. The total number on board was thirteen officers and 372 of other ranks, of whom about 300 were saved by a patrol vessel. The *Anglia* formerly operated between Holyhead and Dublin. She was of 1,862 tons gross, and was built at Dumbarton in 1900.

* * *

MR. S. WILLIAMSON, Secretary and General Manager, Cambrian Railways, has been elected a Director of Wrexham Tenants, Ltd., a branch of the Welsh Town Planning and Housing Trust, Ltd. Mr. Williamson is also Chairman of the Cambrian Resorts Association, and a Director of the Mid Wales Resorts Association, the Cambrian Coast Hotels Co., Ltd., and the Gregynog Estates, Ltd.

* * *

MR. J. HARRISON has been appointed Station Superintendent at Lime Street Station, Liverpool, London and North Western Railway, in succession to Mr. Humphries, who is retiring. Mr. Harrison has had charge of the Basford Hall sidings at Crewe, for several years. It is interesting to note that Mr. Harrison commenced in railway service at Lime Street station as a porter, but returns there as chief.

* * *

THE *London and North Western Railway Gazette* refers to the death of twin brothers, John and Henri Villiers Russell, who went down with H.M.S. *Formidable* on New Year's Day, 1915, and whose bodies, when recovered, were conveyed to Crewe, their native town, for burial—through the kind offices of the chief mechanical engineer, Mr. C. J. Bowen Cooke, who personally conducted the arrangements incidental thereto. A Committee of neighbours, friends and workmates of the joiners' shop was formed to start a fund in order to provide a suitable memorial. This has resulted in a memorial being erected in Coppenhall Churchyard, Crewe.

* * *

NEARLY 350,000 soldiers have been fed at Soldiers' Buffet at Victoria station during the last ten weeks, at an average cost of £150 a week. In aid of the buffet, which badly needs funds, Sir Albert Spicer, M.P., presided recently at an organ recital in Westminster Chapel, Buckingham Gate, by Mr. A. Percy Pomeroy.

* * *

MR. J. H. BALFOUR BROWNE, K.C., well known at the Parliamentary Bar, is retiring from practice in the Committee Rooms. He is 70 years of age, and has long enjoyed one of the most extensive practices at the Bar.

* * *

MR. W. H. ROGERS, Staithmaster, Cardiff Railway, is retiring after serving at the docks altogether fifty-four years. Of this period fifty-two-and-a-half years having been spent with the Bute interests. Since 1874 he has been associated with the coal shipping department.

* * *

ALTERATIONS and improvements at Euston station in the vicinity of the famous Hall are now virtually completed, and a large dining room now occupies the site of the old West Booking Hall. The rooms may be entered from the Great Hall and from platform No. 9. At the north end of the dining room is the smoking room, a small cosy compartment, warmed by an open-hearth fire.

* * *

"LINKS IN A CHAIN" is the title of a neat leaflet issued by the Metropolitan Railway. It is pointed out that "The Met." is in the nature of an endless chain linking up all the termini of our great railway systems, together with many smaller connections with "Tube" lines. Notes are also given concerning places of interest in London.

* * *

IN order to facilitate the working of the heavy suburban traffic in the London area of the London and South Western Railway, there being six lines only on the viaduct carrying the railway from Loco. Junction to Wandsworth Road, an additional line has been constructed, the viaduct being widened for the purpose. In connection with this widening, Wandsworth Road signal box has been transferred bodily from the main to the Windsor line side of the viaduct.

* * *

BRITISH railways have decided not to book seats, with the exception of whole compartments and sleeping berths.

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INSPECTION of stations in connection with the annual platform garden competition on the Portpatrick and Wigtownshire Joint Railways took place on August 5th, and the prizes have been allotted in the following order of merit: Creetown, Millisle, Newton-Stewart, Glenluce, Sorbie, New Galloway, Crossmichael, Stranraer, Kirkcowan, Castle Kennedy, Gatehouse, Palnure, and Parton.

* * *

PRIZES for the best-kept platforms at the stations on the Somerset and Dorset Joint line have been awarded in the following order: Bailey Gate, Midsomer Norton and West Pennard, Glastonbury and Pylle, Evercreech (New) and Masbury.

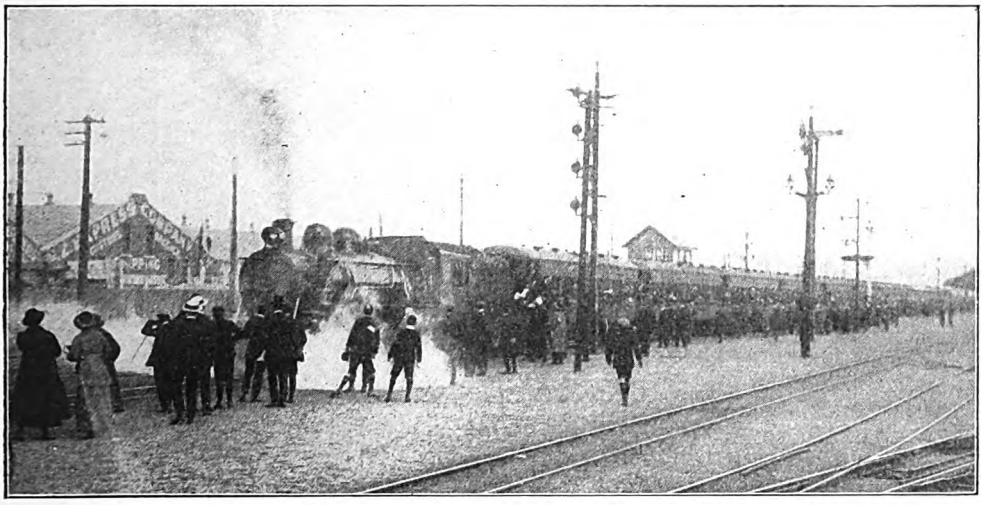
* * *

OWING to the scarcity of fitters, etc., to carry out the necessary repairs, there has been for some time a shortage of locomotive power on the Highland Railway. A Sub-Committee of locomotive superintendents was appointed by the Railway Executive Committee, and at a meeting held at Perth in September it was decided to give assistance from other railways. Five goods engines of the "398" class and one tank have been lent by the North Eastern Railway, two goods engines by the North British, four goods and two passenger by the Caledonian, and four goods and one passenger (of the 1171 class) by the London and North Western Railway, while others are expected. Several of the Highland engines are under repair at Gateshead Works, North Eastern Railway.

* * *

AT a recent meeting of the directors of the Great North of Scotland Railway, Mr. Alexander Duffus, advocate, Aberdeen, was elected a director of the Company.

MR. ALEX. DYCE, a veteran engine-driver on the Highland Railway, died suddenly on the footplate of his engine. He was working the train which left Inverness at 10.50 p.m., and was timed to arrive at Perth at 5.6 a.m. At Inchlea, a little to the south of Newtonmore, Mr. Dyce was overcome by a seizure. He was unconscious when the train reached Blair Atholl, and passed away at Pitlochry. One of our old-standing readers, Mr. Tom M. L. Neish, of Dundee, a number of whose photographs have been reproduced in our pages from time to time, mentions that Mr. Dyce was one of the best-known drivers on the Highland Railway, and has worked "Castle" engines on the main line ever since they appeared. He was for a long period in charge of No. 147 *Beaufort Castle*, his regular duties all the year round being the 10.50 p.m. from Inverness to Perth and the 3.55 p.m. from Perth to Inverness the next day.



EIGHTH REINFORCEMENTS (OTAGO QUOTA) LEAVING DUNEDIN FOR TRENTHAM CAMP, WELLINGTON, NEW ZEALAND.
(*By courtesy of Mr. H. C. R. Balk.*)

THE UndergrounD Railways exhibited on their stations a Christmas shopping bill, which in design is totally unlike the usual posters issued at this season. The work of Mr. A. E. Cox, of the R.B.A., it consists of a black background which throws into strange relief the brilliantly coloured panel on the right-hand side. Within this panel is an effective group of still-life objects, representing an old "Toby" jug, set in the midst of a toy market with quaint little figures in wood. It will be noticed that all these objects are of British workmanship, in fact the market and its figures is a reproduction of one designed by wounded soldiers in the Lord Roberts' Memorial Workshops, and was actually on sale this Christmas.

* * *

THE Board of Trade have recently confirmed the following Order made by the Light Railway

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Commissioners:—West Sussex Light Railway Order 1915, authorising the construction of Light Railways in the County of Sussex from Hunston to West-Itchenor, West Wittering and East Wittering including the reconstruction and working as a Light Railway of the Hundred of Manhood and Selsey Tramway and for other purposes.

* * *

MR. H. MARRIOTT, Chief Goods Manager, Lancashire and Yorkshire Railway, has been re-elected Chairman of the Irish and English Goods Traffic Conference of the Railway Clearing House.

* * *

A DISTINGUISHED Conduct Medal has been awarded to Acting Bombadier John Archibold, R.F.A., formerly a shunter at Darlington, North Eastern Railway, for conspicuous gallantry at Cape Helles (Dardanelles).

* * *

THE total number of North Eastern Railway men enlisted up to November 22nd, 1915, was 9,179, representing 16·85 per cent. of the Company's standard staff.

* * *

IN the Dining Hall of the North London passenger station at Broad Street a presentation was recently made to ex-Chief Inspector Williams on his retirement after fifty-four years' service. Mr. R. H. Patterson, Assistant Superintendent, occupied the chair.

* * *

ON the occasion of the annual rally of the City staff of the London and South Western Railway, held at the Cannon Street Hotel, the goods staff with their friends, numbering about 700, including representatives from shipping, carriers, and City commercial houses, spent a most enjoyable evening. The object of the gathering was primarily to obtain funds for the London and South Western Railway Servants' Orphanage, and this year's effort exceeds that of any similar concert during the past twenty years. The chair was occupied by the Outdoor Goods Manager, Mr. Geo. T. Hedge, who was supported by various chief officers of the Company, including Mr. J. H. Vickery, General Manager, Alexandra (Newport and South Wales) Docks and Railway, and formerly assistant to the General Manager of the London and South Western Railway; Mr. J. Smeal, Indoor Goods Manager; Mr. F. S. Bridge, London Goods Superintendent; Mr. S. E. Marsh, late Goods Superintendent; Mr. R. Davidson, Mr. Northcote and Mr. Moore, Accountant's Department; Mr. S. McLees, Goods Manager's Assistant; Mr. J. Tyler and Mr.

HIGHLAND RAILWAY.

Rounding the Raven Rock, on the Skye Line. Here the grade is 1 in 50 for four miles.

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Hawes, Engineer's Department; Mr. F. Woodbridge, Plymouth; Mr. H. Venton, Exeter; Mr. W. T. Venton, Southampton; Mr. C. Spurgeon, Reading; Mr. S. Waters, Nine Elms; Mr. A. Harris and Mr. F. V. Milton, General Manager's Office; Mr. P. Milton, Goods Manager's Department, and others.

* * *

MR. R. E. L. MAUNSELL, M.A., M.Inst.C.E., Chief Mechanical Engineer, South Eastern and Chatham Railway, has accepted the presidency of the Institution of Locomotive Engineers for 1916, the retiring President, Mr. Alfred J. Hill, M.Inst.C.E., Chief Mechanical Engineer Great Eastern Railway, vacating office at the end of this year. Mr. Hill has been President for two years, although nominally the office is for one year, but owing to the Institution having just become incorporated, Mr. Hill accepted office for a second year to co-operate with the Council in framing the memorandum and articles of association, and covering the period of transition.

* * *

THE death is announced of the Rt. Hon. John Young, P.C., D.L. The deceased was Chairman of the Belfast and Northern Counties Railway prior to its amalgamation with the Midland Railway (England), and was one of the first representative members of the Northern Counties Committee appointed under the Midland Railway and Northern Counties (Railway Purchase) Act, 1903, since which time he has been Chairman of the Committee.

* * *

As from 1st January, 1916, Camden Road and Haverstock Hill Stations, Midland Railway, will be closed.

* * *

AT the December meeting of the Railway Club, Mr. A. W. Bartlett read a comprehensive and informing paper on the Cambridge main line of the Great Eastern Railway. A sketch map had been duplicated to show the original ownership and dates of opening of the various sections, to illustrate the lecturer's historical review, and Mr. Bartlett then proceeded to deal with the line, its characteristics and traffic. A very complete series of photographs of stations was exhibited, and the paper gave rise to an animated discussion. Following the annual general meeting at the Club premises, 92, Victoria Street, London, S.W., on Tuesday, January 11th, an address will be given by the President, Mr. W. Parker.

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ON another page we refer to the inclusion for the 1916 Session of Parliament of a bill promoted by the South Eastern and London, Chatham and Dover Railways for altering and strengthening Charing Cross railway bridge. Further particulars are now available as to what is proposed. At present the six river spans are borne by the two shore end abutments, one pier in the river, and four rows of columns. Four new piers are to be erected additional to the present columns, and the superstructure of this side of the bridge will be carried by arched spans. The existing spans each give a clear waterway of 154 ft., but of the six new spans, four are to be 147 ft., and the remaining two 140 ft.

A PARTIAL return to normal traffic conditions in the Pacific, as far as the Canadian service is concerned, is indicated in an official announcement issued by the Canadian Pacific Railway. The notice states that its liners, *Empress of Asia*, *Empress of Russia*, and *Empress of Japan*, which have been used by the British Admiralty as cruisers since the war broke out, have been released and are being refitted for regular passenger and freight business at Hong Kong.

* * *

IN conjunction with widenings in the suburban area near Melbourne, an equipment of three-position signals has been installed between South Yarra and Caulfield. The signal arms operate in the upper instead of the lower quadrant, with horizontal, 45 deg., and 90 deg. positions. At night the indications for each signal are given by red, yellow, and green lights respectively. The signals are operated electrically. South Yarra Junction is operated from an electro-mechanical locking frame.

* * *

FINDING names for railway stations on lines through new country is not always an easy task. In the case of the Kettle Valley Railway, operating in conjunction with the Canadian Pacific Railway, on its section through the Hope Mountains, construction of which is almost completed, well known characters from Shakespeare have been selected. One station just north of the Coquahalla River Canyon is called Othello, another Lear, a third Jessica, a fourth Portia, followed by Iago. Romeo, another station, is eternally separated from Juliet by Coquahalla Summit, which is 3,300 feet above sea level and not likely to be removed by anything short of an earthquake.

* * *

THE Canadian Northern Railway has despatched its first through passenger train between Toronto and Edmonton. The freight service between these points has been in operation since October 15th. On November 15th the through service between tidewater at Quebec and tidewater at Vancouver was established. The Company is being crowded to its full capacity in handling the grain crop of the prairie provinces, and for the last ten days in October this traffic has shown an increase of 293 per cent. over the same ten days a year ago.

* * *

A PARTY of workmen, numbering about 520, skilled in railway construction, has left Canada for Russia, where they will be engaged in the building of a road which is described as a "war emergency railway." The men were engaged by a firm acting as agents for the Russian Government.

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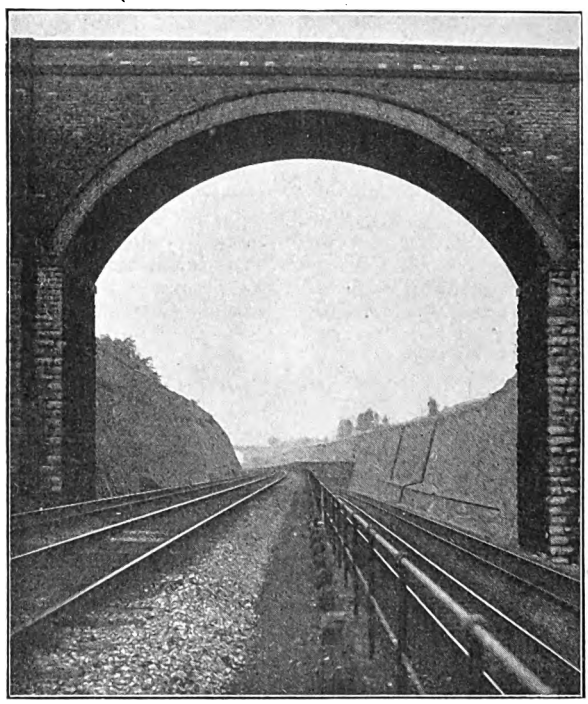
LECTURING at the Royal Geographical Society on "The Railway Development of Africa: Present and Future," Sir Charles Metcalfe explained the long resistance of Africa to the intrusion of settlers by a comparison of its physical features with those of South America and India. At the close of his lecture, Sir Charles referred to "the more difficult task of gratuitous prophecy of the railways of the future." He pointed out that, so far, in many places, rivers have been used as the main arteries of traffic, and railways have been built to work in conjunction with them. Naturally, as trade increases, the railways will be made continuous, the rivers being still used as feeders. This network of veins of railways, which are steadily being pushed forward into the centre of Africa, must inevitably connect, in the future, with great arteries going north and south through the continent. They will be great channels of trade passing through vast territories capable of enormous development, and occupied by millions of people. They will be great arteries connected with the coast on all sides by a network of railway veins to and fro, from which there will be a constant and ever-increasing flow of traffic, until what was inaccessible Africa will lie open to all.



LONDON AND NORTH WESTERN RAILWAY.

Roade Cutting, showing direct main lines and on the descending grade the alternative route to Northampton.

CANADA'S operating railway mileage totalled 30,795 on June 30th, 1914. This represents an increase of 1,492 miles during the fiscal year 1914. The greatest yearly gain from 1908 to 1914 inclusive was in 1913, when 2,575 miles were added, but in none of the other years was the 1914 increase equalled. In addition, 11,472 miles were surveyed in the whole of the Dominion in 1914, 5,521 were under contract, and 3,417 were completed, but not in operation. Alberta had 805 miles under contract and 1,189 completed, but not in operation, while the corresponding figures for British Columbia were 1,235 and 698; for Saskatchewan 340 and 555, and for Manitoba 108 and 134.

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IT is stated that the Egyptian State Railway Administration has formally taken over the Helouan line, belonging to the Egyptian Delta Light Railway Company, Ltd.

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CONSTRUCTION is being pressed forward by the Canadian Pacific Railway of an additional twenty-five miles of line from Foremost, Alta., eastward to a point about ten miles from Lake Pakowki. This will form part of the through line between Weyburn and Lethbridge. Rapid

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progress is being made on the Hope-Coquihalla section of the Kettle Valley Railway, and it is expected to be complete very shortly, though it is not likely that it will be opened for regular traffic until next summer. Ottawa (Sparks Street) station, Canadian Pacific Railway, is now known as Ottawa Central station.

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WORK is progressing steadily on the construction of the Rogers' Pass tunnel, Canadian Pacific Railway. The main tunnel has been excavated for 10,611 ft., or over two miles, under Mount Macdonald. When completed, as it is expected to be in September, 1916, the tunnel will have a length of 26,400 ft. from portal to portal, and it will be 24 ft. high by 29 ft. wide.

* * *

A NOVEL feature has been introduced on Canadian Pacific cars in the form of a special buffet in the dining room, on which cold meats, salads, etc., are tastefully displayed under glass covers, giving passengers an opportunity to select their salads or cuts of cold meat, which are served from the buffet by a chef in white uniform. This is the first time a cold buffet has been introduced on a Canadian dining car.

* * *

A COMMENCEMENT has been made on the construction of a new station on Yonge Street, North Toronto. The new station forms part of a general scheme of development in connection with which the railway tracks are being elevated and all grade crossings eliminated for about three miles. The new station is to be occupied by the Canadian Northern Railway, as tenant of the Canadian Pacific, as well as by the owning Company.

* * *

THE Chief Commissioner of Railways in Queensland, the Hon. Chas. Evans, points out that ever since the commencement of railways it has been a common custom in England and elsewhere to give certain engines a distinctive name ; and even in Queensland the first four locomotives bore a name in addition to a number. For some reason the practice was stopped, but after the Commissioner's return from his tour last year in England, France, Belgium, America, etc., interrupted somewhat by the war, he decided to revive it, and, with the approval of the Government, named the two latest and largest engines *Sir William MacGregor* and *Lady MacGregor* respectively, as a compliment to the late Governor and his lady.

* * *

ROLLING stock supplied by American firms to allied and other European countries is realising enormous totals. Reference has already been made to the order of 250 engines supplied by the Baldwin Locomotive Works, 100 by the American Locomotive Co., and 50 by the Canadian Locomotive Works, all of the 2-10-0 type and intended for Russia ; also the 100 articulated Baldwin engines for France (a number of similar locomotives are being built here, also main line engines) ; together with 2,000 40-ton box cars for Russia and 1,300 covered cars for France and Belgium, built by Canadian firms. Particulars of further orders include 20 2-8-2 engines for Greece, 10 2-6-6-2 and 12 2-8-0 engines for Serbia ; 10 0-6-0 light railway tank engines for Belgium. Contracts for 8,500 pressed steel bogie wagons for Russia and other orders also serve to show that American rolling stock firms are reaping great advantage from present circumstances.

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ON the Victoria Railways experiments have been conducted with a "DD" class locomotive fitted with a superheater in comparison with a locomotive of the same type not so equipped, and the results obtained confirm a saving of from 15 to 20 per cent. in fuel. Prior to the outbreak of war, arrangements were made to secure 50 superheaters of the Schmidt type and one pattern set of the Robinson type, and it is proposed to fit the whole of these appliances to engines under construction. The Chief Commissioner reports: "apart from some minor differences in design, the Robinson and the Schmidt types of superheaters are practically similar, and in view of the fact that there is not likely to be any appreciable variation in economy as between the two types, and that the company controlling the Robinson superheater is wholly British, it has been decided to adopt the Robinson as the standard superheater, and an additional 60 locomotives are to be equipped with superheaters of that type." In view of the increasing demand for locomotive power in connection with goods traffic on the principal main lines it is considered that locomotives of the "Consolidation type" can now be employed with advantage and economy, and it is intended to construct a pattern locomotive at the Newport workshops.

* * *

FROM the General Manager of the Nigerian Railways we learn that even in that part of Africa the war has caused work to be difficult, and has entailed a very careful management in the rearrangement of the service to meet the abnormal conditions. The boat train service has been maintained, though in the latter part of the year at a loss. It is pointed out that if it had been possible to study economy only it should have been suspended. Such a course would have caused great inconvenience to the mining and mercantile communities, and also to the Government. During the first two months of the war a large number of troops and stores were carried over the line under conditions which made economy of train mileage difficult. The ordinary passenger service was curtailed, but not to the extent that might have been anticipated.

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Railway Literature.

THE RISE OF RAIL POWER IN WAR AND CONQUEST, 1833–1914. By Edwin A. Pratt. This volume, published by Messrs. P. S. King & Son, Ltd., traces the use, or the proposed use, of railways for the purposes of war and expansion from the earliest days of their introduction down to the outbreak of the War of the Nations in 1914. It shows that the first suggestions in regard to such use were made in Germany in 1833, and that already in 1842 there was published a detailed scheme for covering Germany with a net-work of lines which would enable her to carry on war on two fronts, France and Russia, at the same time. It gives an account of the part played by railways in the leading wars and expeditions during the period embraced by the review, special emphasis being laid on the fact that the War of Secession in the United States was "the beginning of things" in respect to the scientific use of railways for War; it details the evolution of (1) The armoured train; (2) the hospital train; (3) the fundamental principles applying to the use of railways for military purposes; and (4) the existing organisation in Germany, France and England; it describes the construction of strategical railways in Germany; it adduces considerable evidence in support of the view that, with the help of strategical railways, Germany designed to convert the African continent, as a whole, into a German-African Empire; it deals with the part which the Baghdad Railway was to play in the furthering of Germany's aims against Asiatic Turkey, Egypt and India, and it concludes with sections on "Indian Frontier Railways" and "The Defence of Australia," together with a Bibliography, itself extending over 22 pages. Price is 7s. 6d. net, or 8s. post free in the United Kingdom, and copies can be obtained at the offices of the RAILWAY MAGAZINE, 30 Fetter Lane, Fleet Street, London, E.C.

* * *

"SANDFORD FLEMING: EMPIRE BUILDER." By Laurence I. Burpee. [Price 10s. 6d. net. Oxford University Press.] This volume may be considered as a collection of reminiscences of one of the pioneers to whom the Dominion of Canada owes so much, the late Sir Sandford Fleming. The author has brought together, largely with the aid of Sir Sandford's diaries running back to the year 1845, when the latter left Glasgow in a sailing ship to seek his future in the New World, a fascinating record of personal energy and initiative covering the whole of the 60 years which elapsed before this busy lifetime was brought to a close on July 22nd, 1915. Much is told concerning early railway building in Canada, of the early days of the Northern Railway and the Intercolonial, of the Canadian Pacific as it was made from ocean to ocean, and of many other eventful phases of modern Canadian history and development with which the name of this famous engineer was associated. To all to whom the subject appeals this volume may be commended, not only because of its interest, but also on account of the fund of useful and instructive information therein contained.

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THE RAILWAY MAGAZINE.

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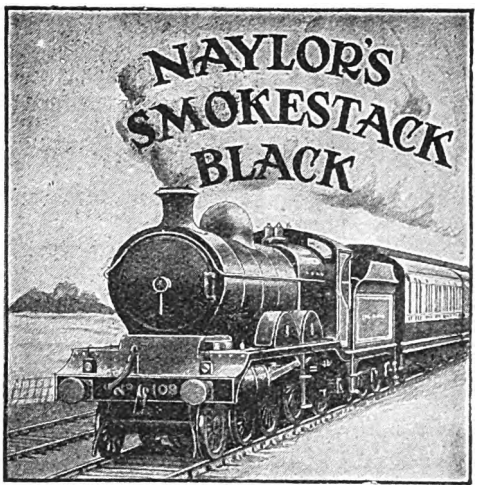

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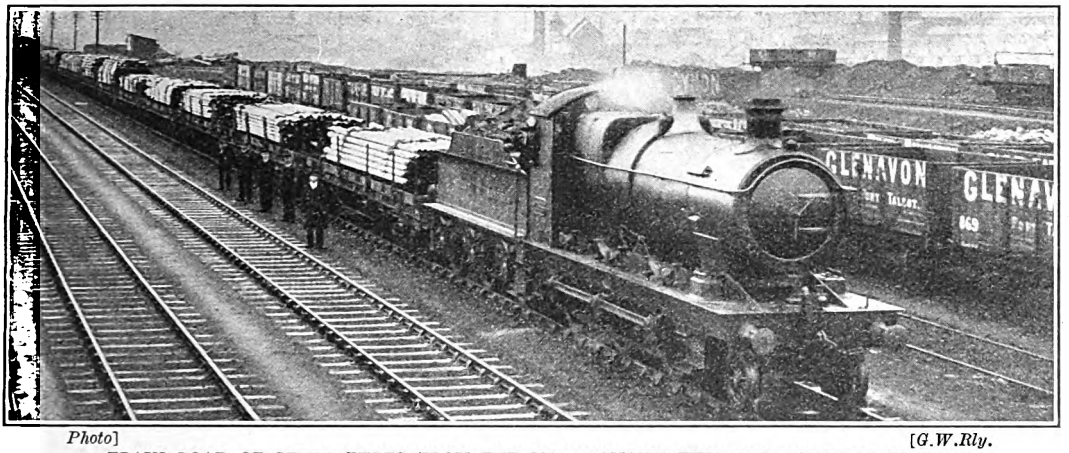

Photo] [*G.W.Rly.*

TRAIN LOAD OF STEEL TUBES FROM THE MANNESMANN TUBE WORKS AT LANDORE.

The Great Western Railway in South Wales
[No. I.]

By DENIS O'DONOGHUE.

LOOKING at a map of the railway system of Great Britain in relation to Wales, it is seen that a trunk line runs from Chester to Newport (Mon.) by way of Shrewsbury, Hereford and Abergavenny. This line is outside the Welsh frontier, except for a few miles in the neighbourhood of Wrexham, but many branches going west serve Wales, and this trunk line might legitimately be considered as forming the Anglo-Welsh frontier, were it not that to do so would mean including large parts of such English counties as Herefordshire and Shropshire and thereby unnecessarily widening the scope of this article.

With the county of Monmouth it is different. Although an English county politically, it is entirely, or almost entirely, Welsh in character. The inhabitants are mostly Welsh, and the natural Anglo-Welsh frontier gives part, if not all Monmouthshire to Wales. Opinions vary a little as to the exact route of this frontier, but the usually accepted line is that provided by the rivers Monnow and Wye to Chepstow. This division allots the major portion of Monmouthshire to Wales, and it is of interest to note that the practice has some legal foundation, seeing that Acts of Parliament legislating for England and Wales specify the area affected as "England, Wales, Monmouthshire and Berwick-on-Tweed."

As the boundary line between England and Wales it is here proposed to follow this "natural" Welsh frontier, considering the railway from Monmouth to Chepstow as constituting the eastern boundary of South Wales. To the north the area under notice is bounded by a line drawn from Aberystwyth on the Cardigan Coast south-east to Abergavenny, thence almost due east to Monmouth.

The most salient feature of the railway map of South Wales is the extreme density of the railway system in the south-east—Monmouthshire and Glamorganshire—as compared with the remainder of South Wales. The south-east corner of Wales is thickly scored by railways running southwards to the coast from an east to west line formed by the railway from Abergavenny to Merthyr Tydfil, concentrating on Newport and Cardiff, with many branches and loops, and linked by another transverse line running from east to west from Pontypool, about mid-way between the east and west railway from Abergavenny to Merthyr Tydfil and the coast. On the other hand, many other districts of the Principality are virtually bare of railways. This marked disparity is attributable chiefly to economic causes. South-east Wales, consisting largely of extremely valuable coalfields, is given over almost entirely to the coal and iron and allied industries, therefore transport facilities are needed on an extensive scale, but in the rest of the country there are, broadly

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speaking, no great industries, and the population, which is sparse, is engaged mostly in farming.

In South Wales the Great Western Railway supplies a highway extending along much of the coast, and with its numerous branch and secondary lines contributes largely to the rail density in the south-east district. The trunk railway from Chepstow, *ex*-London *viâ* Gloucester extends westwards for over 140 miles to Neyland and Fishguard. The newer route *viâ* Badminton and the Severn Tunnel is more than 25 miles shorter. At Newport the South Wales main line is joined by the railway from Abergavenny *ex*-Shrewsbury *viâ* Hereford, Abergavenny and Pontypool, which line between Shrewsbury and Hereford is a joint Great Western and London and North Western railway. From Pontypool on this line a secondary railway flows in a wavy line west, north-west and south-west *viâ* Aberdare and through the vale of Neath to Swansea making connections at Neath and Swansea with the Great Western main line. This secondary line, and its branches with the main line and the railway from Abergavenny to Newport, embrace almost the whole of industrial South Wales—east Monmouthshire and most of Glamorganshire—the limit of the industrial area being reached at Llanelly, 11 miles west of Swansea. West of Llanelly the country is principally pastoral and agricultural.

In order that the main line with its branches may be dealt with in detail in its entirety the better plan will be to deal first with (1) the trunk railway *ex*-Shrewsbury to Newport, (2) the Monmouthshire Eastern and Western Valleys north and south railways which concentrate on Newport, (3) the secondary east and west transverse railway from Pontypool to Swansea, and (4) the line Pontypool-Monmouth-Chepstow.

From Abergavenny Junction, where the London and North Western Company's Merthyr, Tredegar and Abergavenny line goes west, the Great Western line from the north crossing the river Usk, runs $8\frac{3}{4}$ miles to Little Mill Junction, where the line from Monmouth is met, and continuing south through Pontypool and Caerleon, twice bridges the Usk between Caerleon and Newport (High Street) station. East of Newport station the line is united with the trunk lines from London *viâ* Gloucester and *viâ* the Severn Tunnel.

The section from Pontypool to Newport *viâ* Caerleon was incorporated as the Pontypool, Caerleon and Newport railway in 1865 and opened for traffic in 1874. By Act of 1876 the line became vested in the Great Western undertaking, the shareholders receiving an amount of Great Western consolidated guaranteed 5 per cent. stock equal to their holdings, and the loan capital being exchanged for debenture stock of the Great Western Company.

West of the line from Abergavenny to Newport, north and south railways of the Great Western Company run from Blaenavon and from Brynmawr and Ebbw Vale to Newport, the two latter sections uniting at Aberbeeg before reaching the transverse line from Pontypool to Swansea through the Vale of Neath which line links up the north and south lines respectively at Pontypool and Crumlin.

From Blaenavon the railway to Pontypool (Crane Street) station, a distance of over $5\frac{1}{2}$ miles, keeps near the London and North Western Railway line south to Abersychan, and is joined at Pontypool by a branch line starting from the terminus at Abersychan and Talywain of the London and North Western line from Brynmawr, with two sub-branch colliery lines. Another 9 miles south from Pontypool brings the line into Newport. From Pontypool this section runs parallel halfway to Newport with the Pontypool, Caerleon and Newport Railway to which it is connected by a short diagonal line from Cwmbran to Llantarnam Junction on the Caerleon line.

The section from Pontypool to Newport *viâ* Cwmbran was incorporated in 1845. The railway was authorised to be made by the Monmouthshire Canal Navigation Company (which as a canal company had previously been in existence more than 50 years). It was amalgamated with the Great Western Company in 1880 on terms that must have been very agreeable to the proprietors, the holders of debenture and preference stock of the Monmouthshire Company receiving equivalent amounts of Great Western debenture stock, and holders of ordinary Monmouthshire stock receiving £130 of Great Western 5 per cent. guaranteed stock for £100 of paid up Monmouthshire ordinary stock.

From Brynmawr and Ebbw Vale lines run south parallel as far as Abertillery on the Brynmawr line which, just south of this place, bends south-west to meet the Ebbw Vale line at Aberbeeg. The united lines continue south to Crumlin, where the railway from Pontypool to Aberdare and the Vale of

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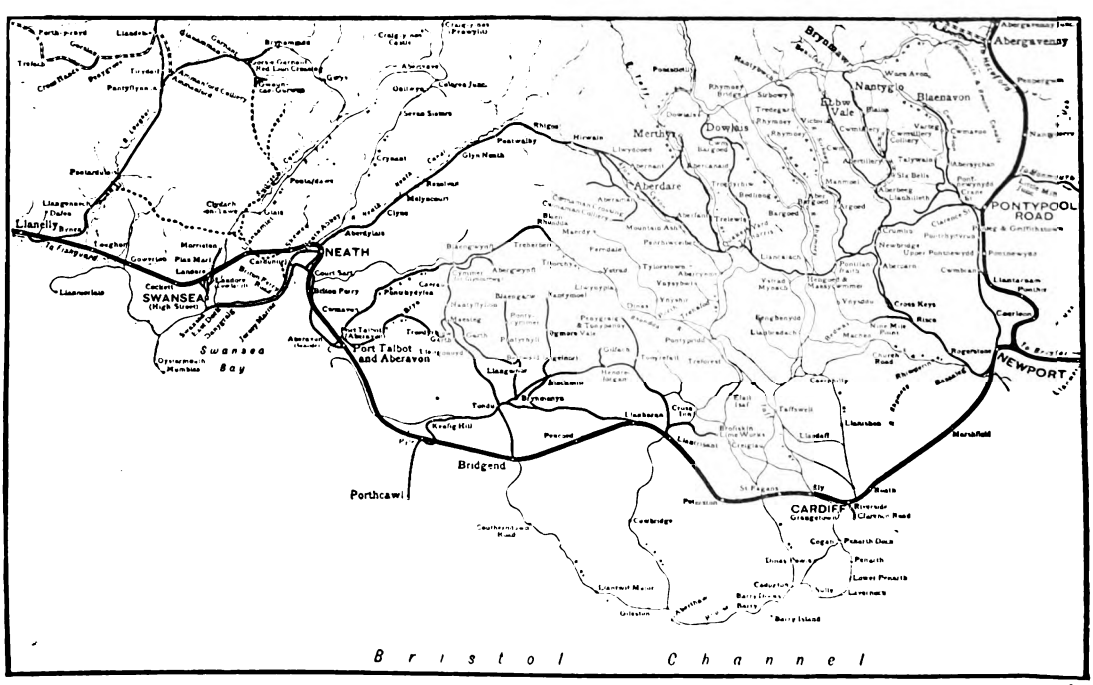
Neath is carried over it by a viaduct. It extends thence south and south-east to Newport, with the short branch a little over 2 miles long from Nine Mile Point meeting it at Risca. From Brynmawr to Nantyglo, the first station south, the line is joint with the London and North Western Company, Brynmawr station being that Company's property.

The Markham Colliery line runs parallel to the London and North Western Sirhowy line until it turns east to cross the Pontypool-Aberdare-Swansea line at Penar Junction. Thence it proceeds south for 9½ miles to join the Western Valleys line at Halls Road Junction, throwing out a branch 2 miles long to Cwmcarn.

The transverse railway from Pontypool to Swansea through Crumlin, Quaker's Yard, Aberdare and the Vale of Neath, besides serving the purpose of linking up the north and south lines of the Great Western, London and North Western, Rhymney, Brecon and Merthyr Tydfil Junction, Taff Bargoed (Great Western and Rhymney Railways Joint), Taff Vale and the Great Western and Rhymney Joint Railways, opens an alternative route for traffic from England and Monmouthshire to Neath, Swansea and beyond. Instead of passing through Newport and along the coast railway *viâ* Cardiff, traffic can go *viâ* Pontypool, Quaker's Yard, and the Vale of Neath to Swansea and destinations west of Swansea. At Pontypool come together the lines from Newport, Abergavenny *ex*-Shrewsbury and Hereford, Monmouth, Blaenavon Great Western Railway, Brynmawr and Blaenavon London and North Western Railway *viâ* Aberyschan and Talywain; at Crumlin lines from Newport and from Beaufort and Ebbw Vale and Brynmawr and Nantyglo; at Pontllanfraith London and North Western Railway Sirhowy Valley lines north from Nantybwch and Tredegar and South from Nine Mile Point; at Hengoed and Maesycwmmer, Brecon and Merthyr Tydfil Junction Railway lines north from Rhymney and south from Bassaleg, and the Rhymney Railway lines north from Rhymney and south from Cardiff; at Nelson and Llancaiach the line is joined by the Taff Bargoed (Great Western and Rhymney Railways Joint) line from Dowlais and a junction is made with the Taff Vale Railway. Further west at Quaker's Yard junctions are effected with the Taff Vale Railway and the Great Western and Rhymney Joint line from Merthyr Tydfil, and at Aberdare (Gadlys Junction) another union is made with the Taff Vale Railway.

From Pontypool the railway tends westward with a slight leaning to the south as



THE GREAT WESTERN RAILWAY IN SOUTH WALES. EAST OF SWANSEA.

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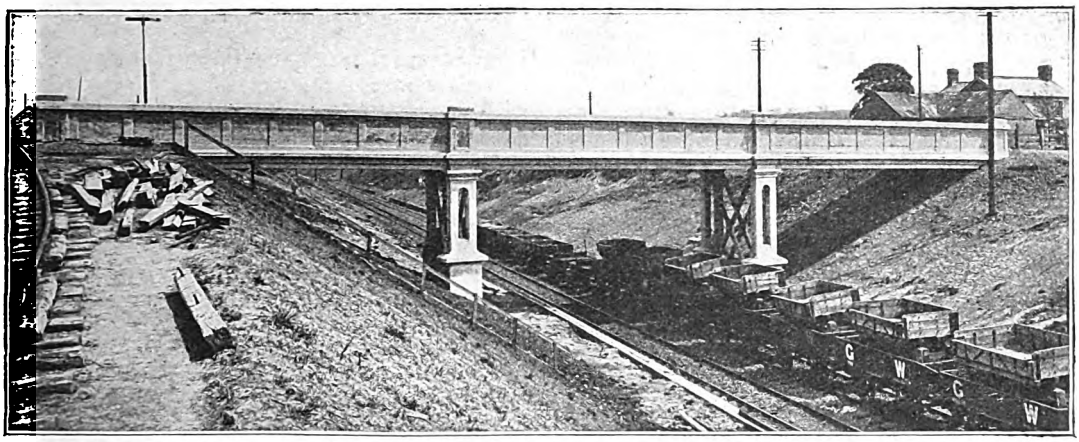

Photo] FERRO-CONCRETE OVERBRIDGE NEAR LLANGYFELACH. [*G.W.Rly.*

far as Hengoed and Maesycwmmer, at which place it takes a turn north-west to Quaker's Yard, an important transfer point with the Taff Vale Railway main line from Merthyr Tydfil to Pontypridd and Cardiff. It is from Quaker's Yard that the Great Western and Rhymney Railway Joint line runs north close to the Taff Vale Company's line, separated most of the way by a canal, to join west of Merthyr Tydfil the Great Western Company's Vale of Neath line running from Merthyr Tydfil to Neath and Swansea.

Leaving Quaker's Yard the line passes north-west through Mountain Ash and Aberdare joining at Gelli Tarw Junction, a mile short of Hirwain, the Vale of Neath line *ex*-Merthyr Tydfil and the Cwmaman branch line. The whole of the district traversed by the railway from Pontypool and the line from Merthyr Tydfil as far as Hirwain is industrial and given over to the working of coal mines, the district supplying anthracite and steam coal of high quality. The northern limits of the Great Western Railway in Monmouthshire and Glamorganshire united by the London and North Western Company's Merthyr, Tredegar and Abergavenny line mark the separating line of industrial South Wales and agricultural Central Wales. To the south of the Merthyr, Tredegar and Abergavenny line is the homeland of coal mines, iron and steel works, and blast furnaces never at rest, whose red fire glow gives to a journey by night a weird and unreal character, a fascinating yet sometimes repulsive experience. By day the country with its chimney stacks, colliery plant and fencings, slag banks, and generally scorched and blackened appearance is anything but inviting. North of the line a few lime works and quarries are dotted about close to the railway, but beyond is the untouched open country stretching beyond the river Usk, with Sugar Loaf mountain marking the east end of the Vale of Crickhowell, and further to the north the Black Forest and Black Mountains.

West of Hirwain the Vale of Neath railway turns south-west and running through pretty country in the Vale of Neath reaches Neath in close company with the Neath canal, whose proprietors, by the way, last year deposited a bill before Parliament seeking authority for extensive works to improve the canal undertaking. The Great Western Act of 1914 authorised the construction of short spurs from the Vale of Neath line, one from a point between Glyn Neath and Resolven, and the other from west of Resolven.

In the environs of Neath the railway comes into contact with numerous tin works. At Neath, where a junction is made with the Neath and Brecon Railway the line crosses the Great Western main South Wales line and running alongside the Rhondda and Swansea Bay Company's railway, exchanges coal and tin works as its setting for coal and copper works, and reaches Swansea Docks and Swansea, Wind Street (goods station).

Swansea in years gone by, made claim to the position of the premier port of Wales, but the vagaries of the tides of Swansea Bay allowed room for the vigorous competition of Cardiff to gradually assert itself, with the result that Swansea was left behind by

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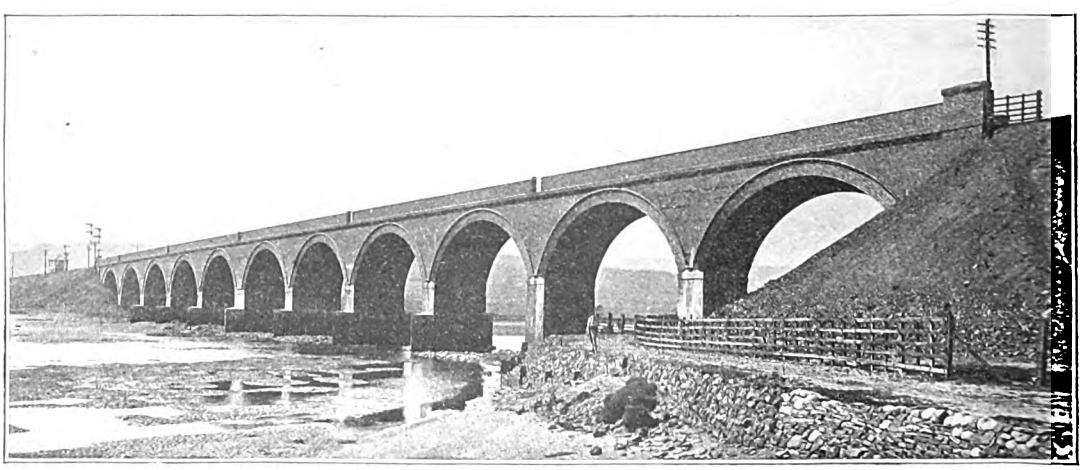
Cardiff in the tussle for supremacy. It is, however, one of Britain's principal sea-ports with an expanding trade; within the Harbour are nine graving docks and the new King's Dock is capable of berthing the largest vessels. The railways of the Swansea Harbour Trust, the body controlling the docks, have direct connections with the Great Western, London and North Western, Midland and Rhondda and Swansea Bay Railways. If it did not succeed in developing into the first port of Wales, Swansea has had consolation and a good degree of compensation in the expansion of the copper industry, which has grown very much in the town and immediate neighbourhood; patent fuel, tin and steel works also form part of the industries carried on around Swansea, and the town is a centre of the anthracite coal trade.

The line extending east from Monmouth to Pontypool is formed by the old Coleford, Monmouth, Usk and Pontypool Railway, which was vested in the Great Western Company in 1887, Great Western consolidated guaranteed stock being issued in exchange for Coleford, Monmouth, Usk and Pontypool Railway shares at par. From Monmouth (Troy) to the junction with the Newport line at Little Mill Junction is a distance of 16 miles. From Monmouth (Troy) south to Chepstow, 14½ miles, the railway follows the river Wye to meet the South Wales main line from Gloucester, which, skirting the coast, is joined at Severn Tunnel Junction by the London main line *viâ* Patchway soon after it emerges from the Severn Tunnel, and so due west for a distance of 17 miles from Chepstow, 9¾ miles from Severn Tunnel Junction to Newport.

Over the trunk railway from Abergavenny to Newport 31 passenger trains pass on weekdays in the southerly direction, with 6 additional on Saturdays, and 32 with 7 extra on Saturdays in the opposite way. The through expresses between the West of England and Lancashire *viâ* the Severn Tunnel, and the South Wales and Birmingham trains use this route. From the old town of Abergavenny, pleasantly situated on the river Usk, the railway runs through open country to Pontypool and serves a number of tin works on the Caerleon line to Newport. Caerleon mentioned by Tennyson in the "Idylls of the King," is a place of first class interest to the tourist and antiquarian. A twelfth century writer said of Caerleon "It was handsomely built by the Romans, adorned with sumptuous edifices, covered with gilded tiles and stately towers, surrounded with brick walls three miles in extent; had ancient temples, an amphitheatre, hot baths, subterranean vaults for ice, hypocausts, reservoirs, aqueducts, and everything that could add to the convenience and pleasure of the inhabitants."

Between Newport and Pontypool the local Eastern Valleys trains work over the Caerleon line between Newport and Llantarnam Junction and over the Monmouthshire line between Pontypool and Cwmbran, crossing from one to the other by the diagonal link line constructed from Llantarnam Junction to Cwmbran. The



Photo] [*G.W.Rly.*

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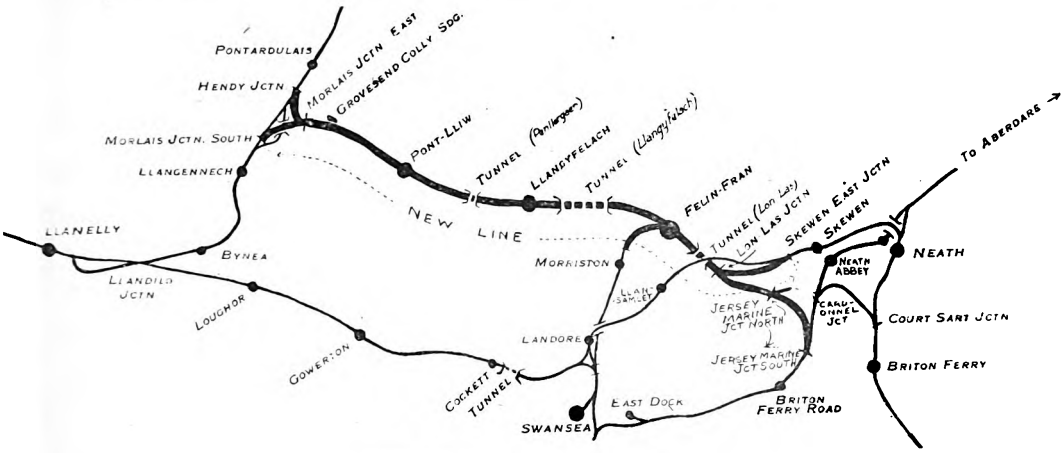

NEW SWANSEA DISTRICT LINE.

Monmouthshire railway south of Cwmbran to Newport is used as a mineral line only. The local passenger service from Newport to Pontypool is supplied by 14 trains Newport to Pontypool and 15 Pontypool to Newport on week-days. From Blaenavon to Pontypool 18 Great Western services are given on week-days with 19 in the reverse direction, one class rail motor cars performing part of the services. Some of the services between Newport and Pontypool and Pontypool and Blaenavon are furnished by trains running through between Newport and Blaenavon. On the Western Valleys Railway there are on week-days 14 trains working through from Newport to Nantyglo and Brynmawr *viâ* Crumlin, with connections to Ebbw Vale, a great steel and ironworks centre; additional services operate on certain sections and the service in the opposite direction is about equal. The passenger service on the Great Western lines in Monmouthshire is augmented generally on Saturdays to suit local needs, while the Sunday service is much reduced. Extensive arrangements are necessary for the colliery workmen and special trains morning and night are provided in the Nantyglo and Aberbeeg districts.

Over the railway from Pontypool to Neath and Swansea *viâ* Hirwain and the Vale of Neath the passenger service is provided by 5 through trains on week-days from Pontypool Road to Neath and Swansea and 2 on Sundays, with 3 on week-days and 2 on Sundays in the reverse direction. Merthyr Tydfil is linked with Hirwain by 9 services on week-days and 2 on Sundays in both directions. All the through trains from Pontypool to and from Swansea take the main line route between Neath and Swansea (High Street) *viâ* Llansamlet and Landore. Trains also work between Quaker's Yard and Mountain Ash and Swansea (East Dock) *viâ* Briton Ferry Road and other sectional services apply on the line, notably between Aberdare and Neath and Aberdare and Swansea; Pontypool Road and Hengoed and Maesycwmmer; Aberdare and Resolven and Resolven and Swansea (East Dock); rail motor cars are used for many of the services. There is no Sunday service on the Swansea (East Dock) line *viâ* Briton Ferry Road. The Cwmaman branch, which is closed on Sundays to passenger trains, is worked by rail motor cars which make 10 trips each way between Black Lion Crossing and Cwmaman, 12 on Saturdays. The line between Nelson and Llancaiach and Quaker's Yard is used by the Rhymney Railway's trains working between Cardiff and Merthyr Tydfil over the Great Western and Rhymney Joint line north to Merthyr Tydfil from Quaker's Yard, the Rhymney Railway from Cardiff making a union with the Great Western line at Penallta Junction east of Nelson and Llancaiach.

The railway from Little Mill Junction on the Newport, Pontypool and Abergavenny line going east to Monmouth is a single line worked by electric train staff, and 5 passenger trains use this line in each direction on week-days, there being none on Sundays. The line serves a pretty country, with the old village of Raglan, half-way between Little Mill Junction and Monmouth.

Between Monmouth, another old place stamped with traditions, and Chepstow the

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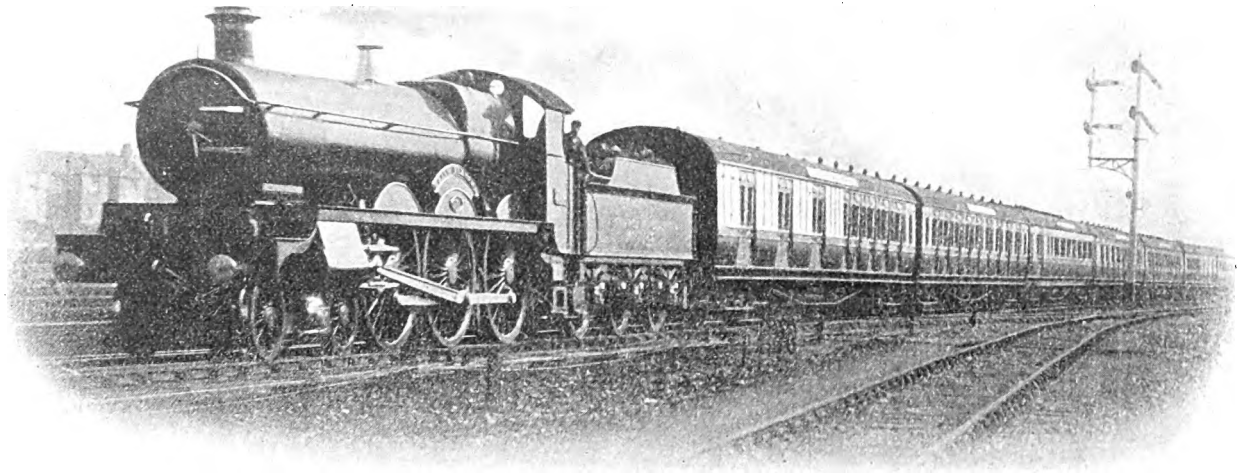

DOWN FISHGUARD BOAT EXPRESS.

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railway traverses the famous Valley of the Wye, worth crossing the Kingdom to view. Tintern is set in some of the loveliest scenery in the country, and Tintern Abbey is admittedly the finest ecclesiastical ruin in the land. Chepstow lies about a couple of miles above the confluence of the Wye with the Severn, and equally with Tintern all travellers grow enthusiastic over its picturesque situation amid woods, cliffs, ruins and water. The view from the cliff on which Chepstow Castle stands is a magnificent one. The railway joining Monmouth with Chepstow is a single line worked by electric train staff and served by 4 passenger trains each way on week-days, and is closed on Sundays.

The main line from Chepstow to Neyland and Fishguard runs south-west to Severn Tunnel Junction where it is joined by the London main lines *viâ* Badminton and Bristol, united at Patchway, emerging from the Severn Tunnel, and thence due west for 9¾ miles to Newport High Street station on a gently rising gradient. From Newport the railway has a beautifully level run of nearly 12 miles to Cardiff, no gradient being recorded for most of the distance. From Chepstow to Newport 14 passenger services are afforded on week-days and 4 on Sundays, the figures for the west to east direction reading 13 and 3 respectively. Over this section of railway other passenger trains work over the whole or part of the distance but do not connect Chepstow with Newport. The 12 miles of railway between Newport and Cardiff are used by 45 ordinary passenger trains passing east and 46 travelling west on weekdays, the numbers on Sundays totalling 17 east to west and 16 west to east. On leaving Cardiff the line spans the River Taff, and passing west to Llantrisant, Bridgend and Pyle, all junction points, runs north-west through Port Talbot to Neath, and west again to Landore, the junction for the Swansea branch. Going westwards from Cardiff the main line railway is mostly on an up gradient, pronounced but not severe, and over this stretch of line passenger train connections are given between Cardiff and Swansea, a distance of 45½ miles, totalling 17 east to west and 16 west to east. Other trains work intermediately without making connections between Cardiff and Swansea. On Sundays the passenger train connections between Cardiff and Swansea are 5 east to west and 7 west to east.

In 1904 the Great Western Company received Parliamentary authority to construct the Swansea District railways. These run from the Vale of Neath line (Aberdare to Swansea *viâ* Neath and Briton Ferry Road) to the Llanelly and Llandilo branch line with junctions to the Great Western main line and Morriston Branch and also to the Rhondda and Swansea Bay Railway, the powers for the last mentioned being obtained in 1909. The principal line leaves the Vale of Neath line north of Briton Ferry Road and passes under the main line between Skewen and Llansamlet, and running westwards *viâ* Llangyfelach joins the Llanelly-Llandilo route between Llangennech and Pontardulais. A spur line makes a connection with the Rhondda and Swansea Bay Railway west of that Company's Court Sart station and the junction with the Great Western South Wales main line is made west of Skewen station by a spur laid from Lonlas Junction, south of the point where the Swansea District line goes under the main line ; west of Felin Fran a junction line runs south to the Morriston branch. The effect of the Swansea District lines is to give an improved means of access to Swansea Docks and to afford relief to the main line and other routes in and around Swansea. At Felin Fran a large nest of marshalling sidings, eight each side of the line, totalling 4 miles in length has been provided and goods stations have been built at Felin Fran, Llangyfelach and Pont Lliw. The line was brought into use in July, 1913.

After Parliamentary proceedings in 1911 and 1912 the Great Western Company obtained sanction to construct a railway from Felin Fran on the Swansea District line northwards past Clydach and Pontardawe to Garnant and Gwaun-cae-Gurwen with branches through the Clydach and Egel Valleys. These lines will serve the rich unworked coalfields of the Cwmgorse and Egel Valleys and with the Swansea District Railways will facilitate the transport of coal from the Gwaun-cae-Gurwen district to Swansea, the traffic, when the lines are ready, being given a direct route *viâ* Felin Fran instead of having to pass by the present circuitous route *viâ* the Llanelly-Llandilo line. The work of construction of these lines has been commenced.

By Act of July, 1914, the Great Western Company is authorised to make an extension of the Swansea District lines from Morlais Junction to Pembrey, and when this line is ready a valuable route will be in being for trains passing from east of Neath to Pembrey and beyond and *vice versâ*, giving much

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needed relief to the South Wales line *viâ* Llanelly.

From the main line at Llantrisant a railway runs a short distance north and bending west approaches gradually the main line which it meets at Pyle. From this track project branches north, one to Penygraig and Tonypandy from the point where the line *ex*-Llantrisant takes its westerly turn; from Hendreforgan to Gilfach; from Blackmill to Ogmore Vale and Nantymoel; from Brynmenyn to Blaengarw and from Tondu to Maesteg, Cymmer and Abergwinfi, the last mentioned meeting the Rhondda and Swansea Bay Railway at Cymmer. The Cymmer and Abergwinfi Branch is extended south of the Llantrisant-Tondu-Pyle line from Tondu to join the main line at Bridgend, and a diagonal line flows east from Tondu to the main line at Llanharan the next station west of Llantrisant. From Blackmill a mineral line is laid down to the Tondu-Llanharan line.

The mode of supplying the passenger train services on the Llantrisant-Tondu-Pyle line and its branches is an interesting one. The services are on week-days only. From Llantrisant a train works 7 times a day, 9 on Saturdays, to Penygraig and Tonypandy and back, but for all the other services Bridgend on the main line is the depôt. From Bridgend 5 trains a day, 1 extra on Saturdays, run to Ogmore Vale and Nantymoel *viâ* Tondu, Brynmenyn and Blackmill, and from Brynmenyn connections are given to the Garw Branch, which at Pontyrhyll makes a junction with the line of the Port Talbot Railway and Docks Company, and from Blackmill to the Gilfach Branch, corresponding services working in the opposite way. Separate trains from Bridgend serve the Llynvi Branch *viâ* Tondu, terminating in some cases at Cymmer, and in others going through to Abergwinfi. Over this branch, on which the service is augmented on Saturdays, extra trains work between Maesteg and Cymmer and Abergwinfi. The railways are single line between Tondu and Abergwinfi and Tondu and Blackmill and Hendreforgan, as are the Ogmore Vale and Nantymoel branches and the Garw branch between Brynmenyn and Llangeinor.

The Porthcawl branch from Pyle is a single line, and on week-days is provided with a service organised from Tondu *viâ* Pyle to Porthcawl and back, plus local branch trains running between Pyle and Porthcawl, but on Sundays the trains to Porthcawl work only from Pyle. Porthcawl, from a port of small importance has become a watering place of renown; it is noted for its dry and bracing air, safe bathing and golf links of the first class.

The Morriston branch, a short line laid down from Landore north, is connected with Swansea on week-days by a service of three passenger trains running each way *viâ* Landore.

After leaving Landore the railway crosses the neck of the Gower Peninsula, negotiating a severe gradient at Cockett, and crossing the mouth of the Burry river arrives at Llanelly, 10½ miles from Landore, a busy town devoted mainly to copper smelting, from which a branch runs north. At Llanelly, where the line is level, the industrial and mineral producing country may be said to end, and the railway commences to run through attractive scenic country for the remainder of its passage through South Wales, on a consistently up gradient. Four miles west of Llanelly is the small port of Pembrey whence the Great Western Railway runs to Carmarthen and Whitland, both important junctions, and on to Clarbeston Road, where it branches south-west to Milford and Neyland and north-west to Fishguard. From Carmarthen a long line goes north to Aberystwyth with branches to Newcastle Emlyn and Aberayron; from Whitland branches run north to Cardigan and south to Pembroke Dock, and from Clynderwen a line branches out in a north-westerly direction to Fishguard, being united at Letterston with the railway from Clarbeston Road.

(*To be continued.*)

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British Railway Service and the War [I.]

IN articles published last year we dealt very fully under the title of "British Railway Officers in War Service" with the principal facts concerning the part played by railway officers and staff in connection with the actual fighting forces and in munition and supply duties, apart from the valuable services rendered by our railways and their staffs in reference to transport of all kinds.

With this new series a wider scope is adopted, and from month to month it is proposed to chronicle items of more general interest appropriate to the new title selected.

We are indebted to the *Great Western Railway Magazine* for the illustration reproduced on the next page of a Roll of Honour which, in a handsome frame, is now exhibited in a conspicuous place on the No. 1 platform at Paddington station, in memory of the late Great Western men who have fallen in the war. The middle panel of the Roll of Honour bears the following inscription :—

> "The names shown hereon are those of members of the staff of the Great Western Railway Company who have lost their lives in the war. Many of them were called upon to participate in some of the fiercest fighting of the campaign; they upheld the best traditions of their Country, and their loss is deplored alike by the Company and their comrades.
>
> "Up to November 8th last, 14,788 Great Western men had joined His Majesty's Forces, representing more than eighteen per cent. of the Company's staff."

On the side panels are the names of 294 late members of the Company's staff, arranged in alphabetical order and under the departments to which they were attached.

The design is the work of Mr. C. E. Power, of the Great Western Railway Electrical Engineer's Department. The frame is 6 ft. wide by 4 ft. 6 in. deep. It is intended to exhibit a similar Roll of Honour at all the principal stations on the Company's system.

At present the working of Lord Derby's Attestation Scheme is still of special interest, and figures published by the Great Western Railway show that, notwithstanding a total of 15,263 men previously serving with the colours, a percentage of 19·2, no fewer than 20,809 others presented themselves for attestation, while 2,755 were rejected or put back for further consideration. These figures aggregate 38,827, or 49 per cent. of the total staff of all ages.

To the list of Great Western Railway commissioned officers the following additions may be noted :—2nd Lieut. F. Wadner, King's Royal Rifle Corps (Goods Department, Bristol); 2nd Lieut. H. R. Jones, 12th South Wales Borderers (Chief Goods Manager's Office); 2nd Lieut. H. W. Thomas, 7th Wilts Regt. (Locomotive and Carriage Department, Swindon); 2nd Lieut. H. Colbourn, King's Shropshire Light Infantry (Chief Goods Manager's Office); Lieut. C. Lambeth, 1st South Western Brigade, R.A.M.C. (Locomotive and Carriage Department, Swindon); 2nd Lieut. B. T. Alford, Somerset Light Infantry (Engineer's Office, Paddington); Lieut. G. Girdlestone, 9th Service Batt., Devonshire Regt. (Drawing Office, Locomotive and Carriage Department, Swindon); 2nd Lieut. M. Jones, Wilts Fortress R.E. (Drawing Office, Locomotive and Carriage Department, Swindon); 2nd Lieut. M. G. Tweedie, R.E. (Signal Engineer's Office, Reading); 2nd Lieut. F. Sargent, Railway Transport (General Manager's Office); 2nd Lieut. S. H. James, Royal Garrison Artillery (Locomotive and Carriage Department, Swindon); 2nd Lieut. E. R. Millard, 3rd Wilts Regt. (Drawing Office, Locomotive and Carriage Department, Swindon).

The Great Western (116th) Company of Royal Engineers has been busily engaged on railway work of an urgent nature in the North of England. Great excitement was caused one day recently, reports our Great Western contemporary, by a wire being received at 11.30 p.m. to the effect that a detachment of men and officers was to leave in the morning as an advance party for overseas. This meant a great hurry to get off in time, as some overseas equipment had to be issued and rations provided. However, the men caught the train all right and went off amid the cheers of their comrades. Two days later they all came back, as the authorities had found it necessary to cancel the embarkation. There was a good deal of

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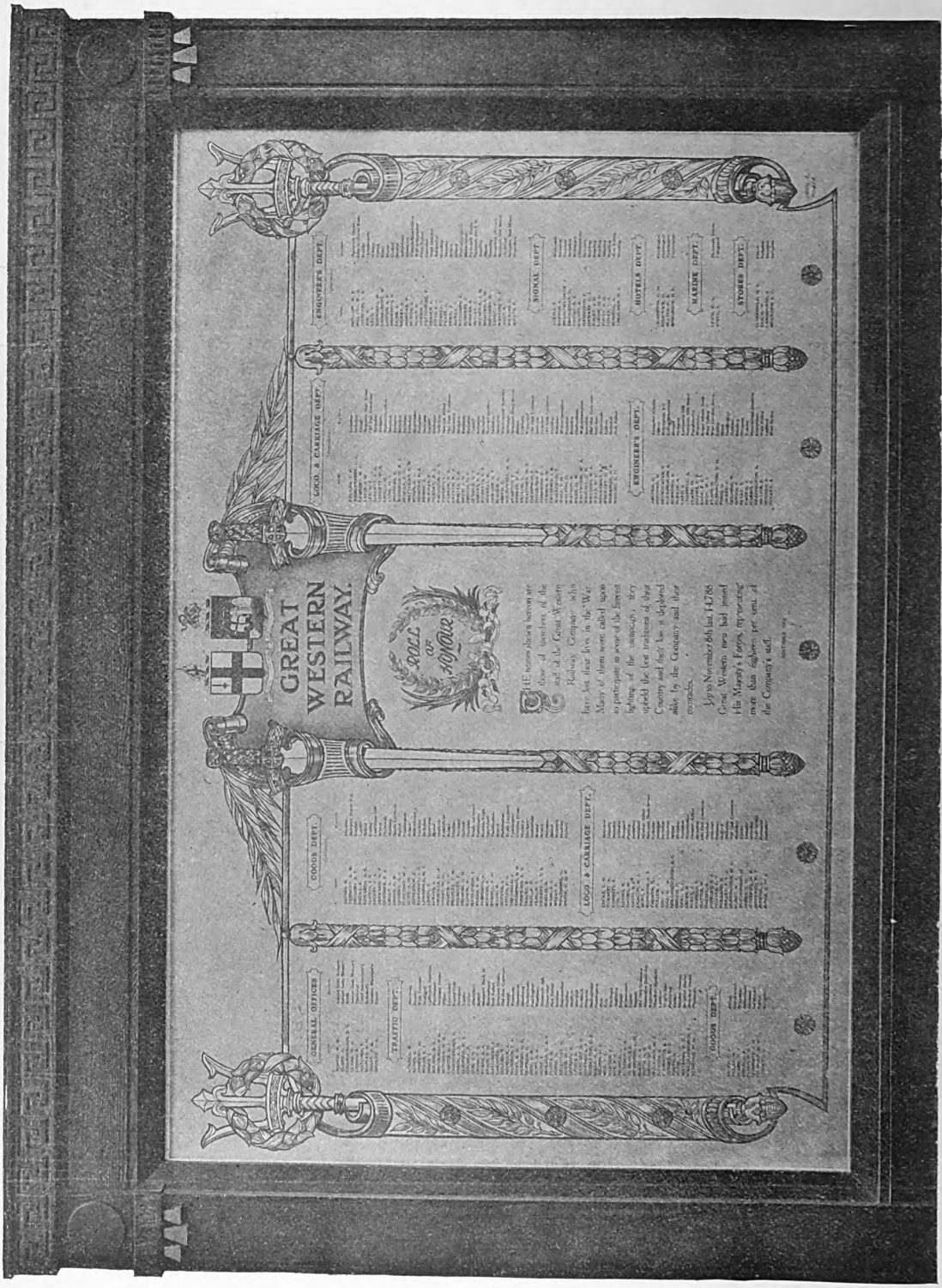

ROLL OF HONOUR: GREAT WESTERN RAILWAY. Exhibited on No. 1 Platform at Paddington Station.

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disappointment at this, but it was not without its humour.

In order to make the establishment of the Company more complete, it has been found necessary to draft in some additional artisans; and seventeen men have had to be transferred from the Company to the Railway Troops Depôt.

On the Great Eastern Railway an artistic "Roll of Honour" has been adopted for use throughout the system. Copies are framed and each station enters the names of those members of its staff who are serving, or have served, in many instances with the sacrifice of life, with His Majesty's forces.

Several Great Central Railway items may be noted, and we are indebted to the *Great Central Railway Journal* for the portraits reproduced. Lieut. G. A. Gibson, who was assistant to the Engineer of the Keadby Extension Widening, joined on May 19th the 224th Field Company, 40th Division R.E., a new regiment formed at Doncaster, and was given the rank of lance-corpl.; two months later promoted to corpl. He took courses at Fiskerton in pontooning, and was subsequently sent to Chatham as acting-sergt. in charge of ten corporals, where he passed his courses in drill and duties, field-works and demolitions. On his return to Doncaster he was promoted to 2nd lieut. and is now officer commanding the 40th Division depôt at Doncaster, where he has charge of the recruiting office, and since his appointment there a number of Great Central men have joined the regiment. Lieut. Gibson is a son of Mr. Geo. J. Gibson, District Traffic Manager, Manchester.

2ND LIEUT. T. T. BINNS,
13th Batt. Worcestershire Regt.

2ND LIEUT. W. H. C. BINNS,
11th Batt. East Surrey Regt.

Sons of Mr. T. H. Binns, Stationery Storekeeper, Great Central Railway.

The two sons of Mr. T. H. Binns, Stationery Storekeeper, 2nd Lieut. T. T. Binns, 13th Batt. Worcestershire Regt., and 2nd Lieut. W. H. C. Binns, 11th Batt. East Surrey Regt., were trained at the Manchester University Officers' Training Corps. Lieut. T. T. Binns was gazetted on May 31st, 1915, drafted to Glasgow, thence to Worgret Camp, Dorset, from there to Swanage, and is now at Blandford and has been appointed Assistant Transport Officer to his battalion. Lieut. W. H. C. Binns was gazetted on October 7th,

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bridgework, etc., Engineer's Department, Midland Railway, Derby, is at the present time filling a responsible appointment under the Minister of Munitions in the Birmingham and Coventry districts.

Lance-Corpl. George Hall, of the 8th Leicestershire Regt., has been granted a commission as 2nd lieut. in the West Yorkshire Regt. He is the son of Mr. A. Hall, of the Accountant's Department, Midland Railway, Derby, and before war was on the clerical staff of the same department. Temporary Lieut. Archibald H. Tatlow, of the Royal Warwickshire Regt., has been gazetted temporary captain, dating from November 22nd, 1915. Before the war he was an inspector of the staff of the Midland Railway hotels department. Mr. Francis Moore, of the Inns of Court Officers' Training Corps, has been gazetted 2nd lieut. in the City of London 3rd Royal Fusiliers. He is the son of Mr. R. Moore, Chief Goods Manager's Department, Midland Railway, Derby.

Amongst those who have been gazetted 2nd lieut. in the Sherwood Foresters (Notts. and Derbyshire Regt.) appears the name of Frank John Kiddy, formerly of the claims office, Chief Goods Manager's Department, Midland Railway, Derby. At the outbreak of war he joined the 4th Hussars at The Curragh, where he worked his way up to the rank of sergeant. He had previously served in the Boer War, going out to South Africa as a trooper with the Derbyshire Imperial Yeomanry, and returning as quartermaster-sergeant in the same regiment. Lieut. Kiddy is the eldest son of Mr. G. H. Kiddy, cashier of the Chief Goods Manager's Department, who has also two other sons with the colours, *viz.*, Staff-Sergt. Harry Kiddy, Indian Supply and Transport, Mediterranean Expeditionary Force, and Sapper Fred. Kiddy, R.E., who has been in France since November, 1914.

Mr. N. H. Underwood, third son of Mr. Thos. Underwood, of the Midland Railway Accountant's Department, has been appointed a 2nd lieut. in the Leicester Regt. Mr. Percy L. Gold, goods agent, Midland Railway, Northampton, has been gazetted 2nd lieut. in the Royal Warwickshires. He is the son of Mr. J. Gold, who up to January, 1915, when he retired, held the dual position of district goods manager and goods agent for Birmingham.

The announcement will be heard with regret of the death of Lieut. Montague Wilfred Aulton Smith. Before the war, Lieut. Smith, who was 25 years of age, was

LIEUT. G. A. GIBSON,

Formerly Assistant to the Engineer in charge of the Keadby Extension Widening: Great Central Railway.

in the control section of the General Superintendent's department, Midland Railway, Derby. He enlisted on September 18th, 1914, received his commission in the Royal Field Artillery towards the end of October, and proceeded to the front July 14th last. He was first with the ammunition column, but a week before his death was sent up to the battery. He was on duty in a telephone dug-out, when a shell struck it, killing Lieut. Smith, his servant, and ten other men.

Temporary Lieut.-Col. C. W. Paget, R.E., son of Sir Ernest Paget, Bart., and General Superintendent of the Midland Railway, has been mentioned in Sir John French's despatch.

The Supplement of January 1st to the *London Gazette* contained the following:—

"Engineer and Railway Staff Corps: To be Majors:—

"C. J. Bowen Cooke.

"Henry Fowler.

"John Black.

"Suply. Lieut. Gilbert S. Szlumper, from Hants (Fortress) R.E."

Mr. Bowen Cooke and Mr. Fowler are the Chief Mechanical Engineers of the London and North Western and Midland Railways respectively. Mr. Black is the Superintendent of the Line, North British Railway; and Mr.

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Szlumper is Assistant to the General Manager, London and South Western Railway, and Secretary to the Railway Executive Committee.

The Maryport and Carlisle Railway "Roll of Honour" gives the names of 56 employés who have enlisted in His Majesty's Forces. Of these ten have been killed, their names being noted in red in contrast to the usual blue employed for the decorated poster on which the names of all are noted.

By November 1st over 5,000 men had left the service of the Great Eastern Railway for the Army or Navy. During the early part of December the company placed rooms at Liverpool Street and Stratford at the disposal of the military authorities for recruiting purposes under the Derby Scheme. The approximate number of Great Eastern Railway men who have offered themselves under the Derby scheme is 10,000.

We regret to learn of the death of Capt. R. B. Burgess, R.E., only son of Mr. H. G. Burgess, Irish Traffic Manager, London and North Western Railway.

Up to December 10th the total number of London and North Western men who have joined His Majesty's forces was 17,537, or in round figures one out of every five of The Company's employés.

The following table, given by our Euston contemporary, shows how London and North Western men have responded :—

Date.	Number.
1914.	
August	5,529
September	9,528
October	9,849
November	10,828
December	11,449
1915.	
January	11,970
February	12,233
March	12,544
April	13,439
May	14,488
June	15,484
July..	16,019
August	16,302
September	16,563
October	16,870
November	17,357

In addition to the lists already published of London and North Western men who have won distinction during the war, particulars are now available of the following :—

Lieut.-Col. F. A. Cortez Leigh, Western Signal Companies (Army Troops) (Chief Electrical Engineer of the Company); awarded the Territorial Decoration for distinguished and meritorious service.

Sergt. S. V. G. Robinson, 2nd Batt. Wiltshire Regt. (formerly Cleaner, Locomotive Department, Coventry); awarded the D.C.M. for conspicuous gallantry on September 25th, 1915, near Vermeilles.

Lance-Corpl. W. Burke, 9th Manchester Regt. (T.F.) (formerly Porter-Carter, Goods Department, Ashton); mentioned in the despatch of August 26th, 1915. Lance-Corpl. W. Burke died of enteric fever on July 28th.

Lance-Corpl. G. Gostelow, 1st Batt., Oxford and Bucks Light Infantry (T.F.) (formerly apprentice Fitter, Carriage Department, Wolverton); commended by the Commander of his Division for distinguished conduct in the field.

Corpl. T. H. Hamer, 95th Field Company, R.E. (formerly Labourer, Wagon Department, Earlestown); commended by the Commander of his Division for conspicuous bravery in the field.

Lance-Corpl. F. Mahan, 1st-7th Sherwood Foresters (T.F.) (formerly Fireman, Locomotive Department, Netherfield); commended by the Commander of his Division for conspicuous bravery in the field.

The following additions to the list of London and North Western Railway employés now holding commissions in His Majesty's Forces may be noted :—

H. W. Dann, 2nd Lieut., R.E.

F. Baxter, 2nd Lieut., Kent Fortress Engineers.

Mr. Dann was formerly a quantity surveyor attached to the Chief Engineer's staff at Euston, and had seen service in France with the Queen's Westminsters before obtaining a commission. Mr. Baxter was assistant to Mr. Wood-Hill, the London Divisional Engineer.

The staff of the Midland and Great Northern Joint Railways who joined the Colours up to November 30th totalled 345, comprising 45 Reservists, 51 Territorials, 249 Volunteers. One man has recently been killed in action, one has died in Egypt, and one has been discharged from the Army as medically unfit.

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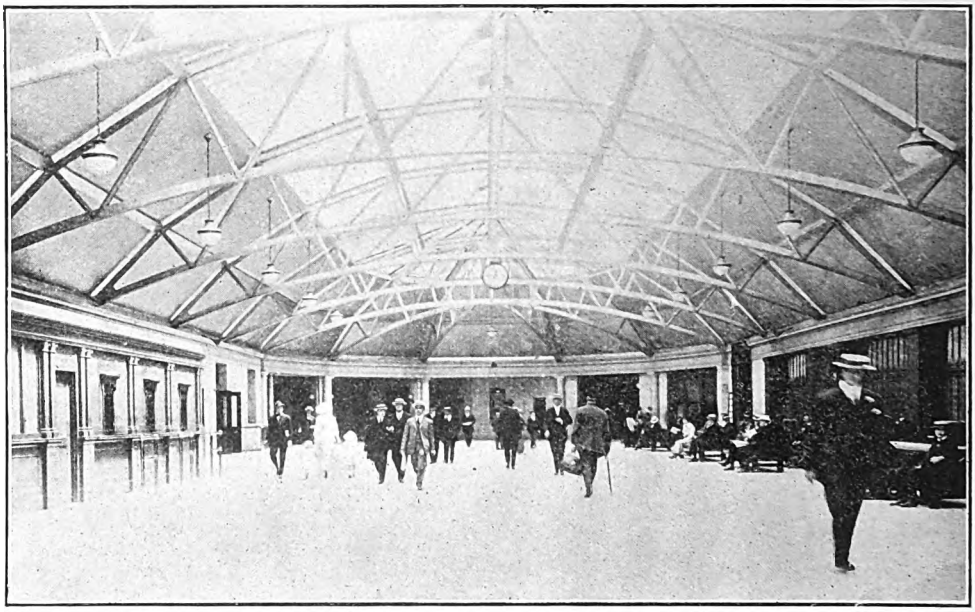
of 170 feet on St. Antoine Street, while the tower, the most prominent feature of the whole building and one of the most striking objects in Montreal, rises 225 feet above the St. Antoine Street level.

As the station is built upon a hill, the concourse is entered on the level from Osborne Street and from St. Antoine Street by elevators. Skylights which extend the full length of the concourse supply natural light.

The cubic capacity of the new portion of the building is nearly five million feet. Underneath the main floor and extending beneath the tracks are vaults having a ground area of 66,000 square feet and affording storage space that will accommodate the records for many years to come; an immigration hall covering 10,000 square feet; and a Chinese waiting room and a third class waiting room, which together take in nearly 10,000 square feet additional. On the main floor is the concourse, out of which open on one side the waiting rooms, and on the other the doors leading to the tracks.

There are eleven tracks, all covered by train sheds of the Bush pattern, well lighted and so well provided with roof drainage as to ensure clean and dry platforms at all times; on six of the tracks the sheds are 1,000 feet long, on two 800 feet, on two more 550 feet; and on track 1, designed especially for suburban traffic, 420 feet. The main waiting room has a ground area of 7,800 feet, and a striking feature in it is a large statue of Lord Mount Stephen, who was the Company's first President. The dining room (a very handsome apartment) seats 142 and the lunch counter 90 people.

The main waiting room, with ticket offices and news-stand between, and with ladies' and gentlemen's waiting rooms at either end, opens on to the concourse. The main waiting room is finished in marble, the general design being simple but effective and the lighting is excellent. Connected with the ladies' waiting room is a nursery, where children requiring to wait over for connections may be made comfortable.



CONCOURSE: WINDSOR STREET STATION.

At the south end of the concourse, near the elevator approach from St. Antoine Street, are the dining room and lunch counter, also the parcels office. At the opposite end and extending along Osborne Street are the baggage and express rooms, etc.

Quebec limestone was used in constructing the exterior of the building and, for the interior, marble has been largely employed in the finishing of the principal halls and corridors—giving a very fine effect indeed.

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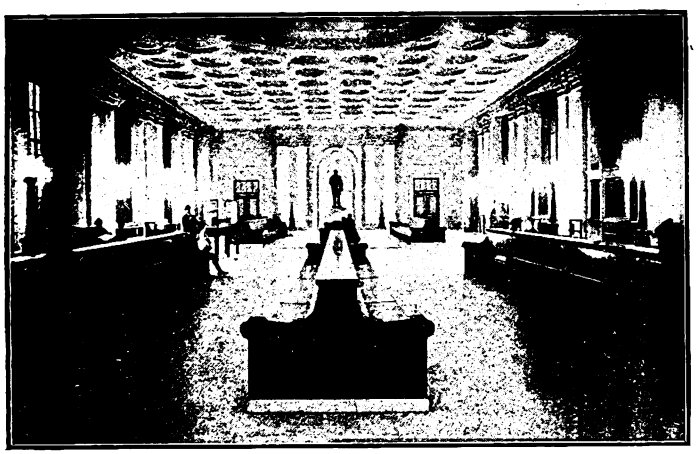


MAIN WAITING ROOM.

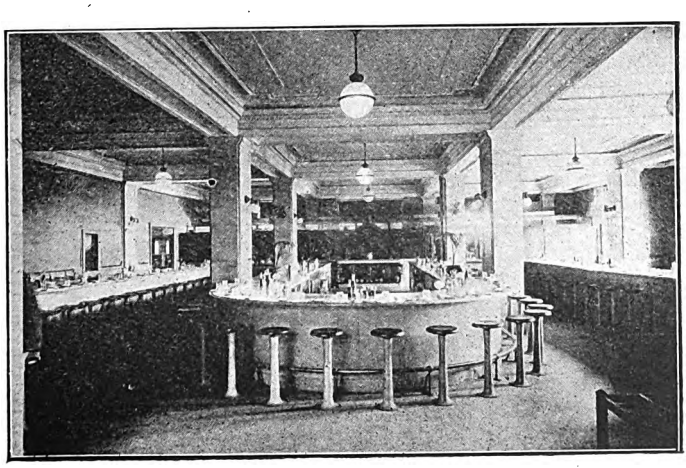
2,800 tons of steel were required for the extension, besides which the train sheds called for more than 2,000 tons. The tower, which is the most massive in Canada, is 15 stories high, or 16 including the basement. At the summit are water tanks giving a capacity of 30,000 gallons. It is, roughly speaking, about nine times as large as the tower of the original station, and the present building stands in about the same proportion to the original structure.

The building is heated by a battery of three 400 h.p. water-tube boilers, equipped with superheaters. The smoke stack is of white brick, 220 feet high with an outside diameter of 16 and inside of 12 feet.

Windsor Street station has thirteen elevators all operated by hydraulic pressure from pumps located in the engine room. There are three sets of duplex pumps, two of which have each a capacity of 500 gallons and the third a capacity of 1,000 gallons per minute.

Extensive use of compressed air is made in connection with train movements in the station and for it there is an elaborate system of machinery. There is also an extensive refrigerator system, including three ammonia compressors, which is capable of making 25 tons of artificial ice per diem for use in the dining and lunch rooms and on the dining cars. Great care has been taken in dealing with the ventilating problem, which in a building of Windsor Street station's magnitude is a difficult one, and the results are very satisfactory, the air being thoroughly changed every few minutes. Many electrical devices have been employed, chief among them being the arrangement whereby all switches in the station yard are controlled entirely by electricity and operated from one signal-tower; all the clocks throughout the building are controlled electrically by one master clock; and the large trucks used in handling baggage between the baggage-room and the platforms in the train shed are equipped with storage batteries and motors.

The capacity of the tracks, making due allowance for locomotive length, is about 120 cars, the platforms varying in length from the equivalent of a 5-car to a 14-car train. The whole of the switching arrangements are controlled from an interlocking tower. The Windsor Street Station is the largest in Canada and compares very favourably in convenience, comfort of passengers and facilities for handling a large traffic, with any in the United States or Europe.



LUNCH COUNTER.

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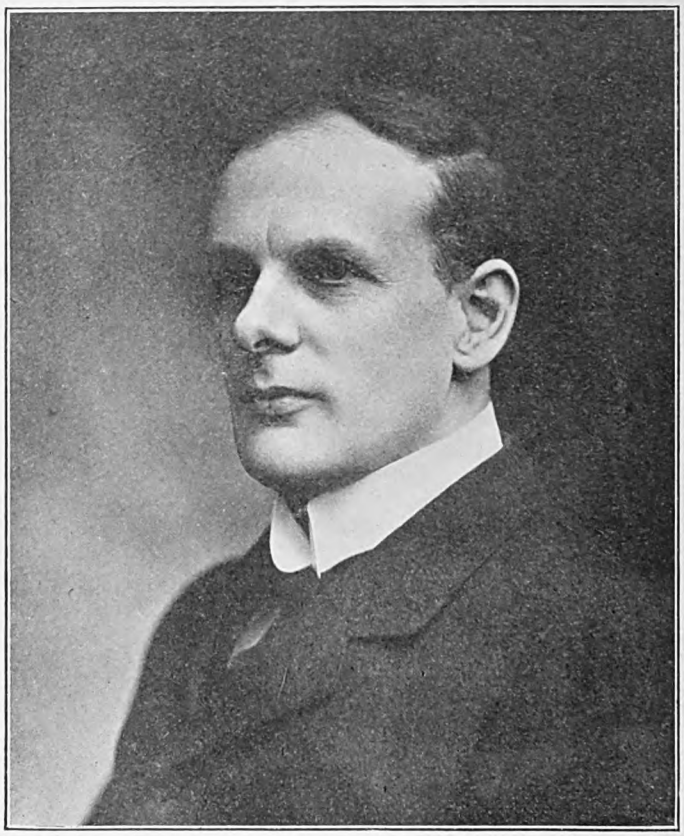
THE RAILWAY PORTRAIT GALLERY.



Photo] [*Elliott & Fry.*

SIR FRANCIS HENRY DENT,

General Manager,

South Eastern and Chatham Railway.

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ANOTHER RAILWAY KNIGHTHOOD.

A New Year Honour for the South Eastern and Chatham Railway General Manager.

THERE was throughout the British railway world a general chorus of approval when it was announced on January 1st last that His Majesty the King had been graciously pleased to confer the honour of Knighthood upon Mr. Francis Henry Dent, the General Manager of the South Eastern and Chatham Railway.

Born in 1867, the second son of the late Admiral Dent (who for a long period was Marine Superintendent of the London and North Western Railway) Sir Francis is the third British railway officer and member of the Railway Executive Committee to receive the accolade since the outbreak of War in August, 1914.

It was with the London and North Western Railway, at the age of 17 years, Sir Francis Dent began his railway career in the office of the General Manager at Euston station, London. In 1886 he was transferred to the department of the Superintendent of the Line, and three years later became an Outdoor Assistant to the Superintendent. The year 1893 found him Assistant Superintendent of the Chester and Holyhead Division, and six years later, when only 32 years of age, he was appointed Superintendent of the same district, and in October, 1901, he took charge of the District Goods Manager's Department as well.

March, 1902, saw Sir Francis back in London as District Goods Traffic Superintendent with headquarters at Broad Street station. During his occupancy of this post he introduced several effective reforms in the administration of the company's business, and in the spring of 1903 he visited the United States of America with a party of London and North Western Railway officers.

In April, 1907, he left the London and North Western Railway service to become Chief Goods Manager of the South Eastern and Chatham Railway, and he held this appointment until the retirement of the late Mr. Vincent W. Hill, whom he succeeded as General Manager on April 1st, 1911.

Sir Francis was Chairman of the Railway Clearing House Goods Manager's Conference, 1909, and he is a member of the Advisory Committee on railway subjects at the London School of Economics, and a member of the Court of Governors of that institution.

In his capacity as a member of the Railway Executive Committee appointed by the British Government to administer, during the War, the principal railways of England, Wales and Scotland, Sir Francis has won the esteem of all with whom he has been brought into contact, and it is an open secret that the great ability he has shown in mastering the severe problems of railway working encountered on the South Eastern and Chatham Railway by the enormous influx of goods traffic on account of the War, to say nothing of the troop and Red Cross passenger trains, has provoked the admiration of all qualified observers.

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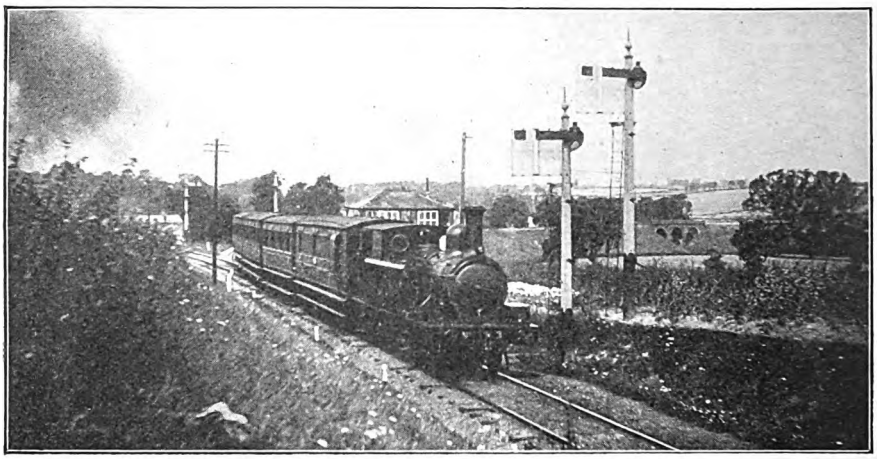

Photo] [*K. A. C. R. Nunn.*

COLNE VALLEY AND HALSTEAD RAILWAY.

11.25 a.m. Haverhill-Chappel train passing Colne Valley Junction cabin.
2-4-2 tank engine No. 3.

British Locomotive Practice and Performance.

By CECIL J. ALLEN.

SINCE dealing with the work of 4-4-0 locomotives, in the November and December issues of 1915, I have been reminded by more than one correspondent that rather scant justice was done to what might reasonably be termed the "Premier" 4-4-0 line—the Midland Railway. Any such omission must obviously be attributed to want of space rather than lack of material. Further, a delving among my letters during the welcome inactivity of the Christmas holidays has revealed the fact that I have quite a number of Midland "logs," kindly supplied by correspondents, which have never yet enjoyed the light of publicity. Consequently, I propose to devote this article exclusively to records of Midland performance.

The Midland is in various respects a unique line. Considering that it occupies about the third place in the country as regards length, traffic and resources, it is a matter for comment that in these days of vast locomotives nothing has been built at Derby larger or more powerful than can be placed upon eight wheels, for passenger traffic, and upon six wheels, for goods and mineral service, with the exception of the "Consolidation" locomotives built for the Somerset and Dorset Joint Railway. Indeed, the whole policy of the Company seems to be that of moderate loads coupled with as high a speed as is practicable. It is a policy that has been reduced in its details almost to a fine art, with the result that regularity and punctuality in working is probably more pronounced a feature of Midland operation in normal times than in that of any other line. There is, of course, no particular virtue attaching to the use of locomotives of moderate power, and it must not be supposed that the Midland line is worked more cheaply than any other in view of the moderate tractive power of the engines employed. The whole question of railway operation is one of infinite complexity. It would be most difficult—indeed, practically impossible—to prove that the Midland method, which entails the use of engines well suited in tractive power to moderate loads, and freely piloted in the case of loads at all out of the ordinary, is either more economical or more extravagant than the methods of other companies. By the rigid restriction of loads, undue fuel consumption and "thrashing" of the engines is avoided, but on the other hand, the extra wear and tear, not to mention the wages of additional drivers and firemen, must be a heavy item in the piloting of so many trains.

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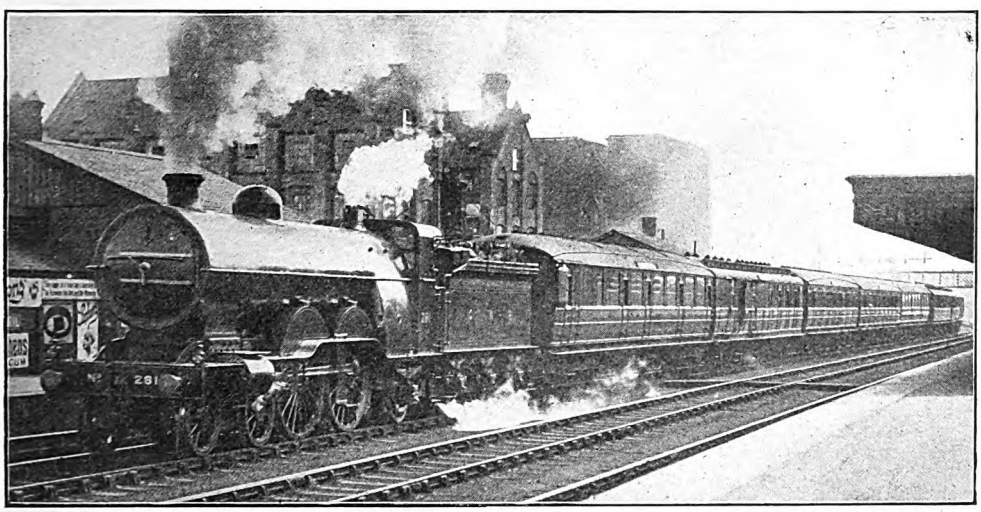
Double-heading is certainly far more prevalent on the Midland than on any other British line. I am not aware of any other company which has incorporated in its locomotive designs a constructional feature specially connected with piloting. By this I refer to the wheel-guards now fitted in front of all Midland express engines, principally in order to protect the bearings of the train engine on a piloted train from the rush of water that occurs when the leading engine is picking up from track-troughs. This, of course, is a mere detail, although it is significant of Midland working practice. Further than this, as is probably well known to most readers, the Midland working timetables indicate with each express train the maximum load that may be taken by each class of engine. Any excess of this load is met, whenever possible, by the provision of a second locomotive. There are four classes of express engines. Class 1 includes the single drivers and the old 2–4–0 engines, which, of course, but rarely appear at the head of a first-class express, except as pilots. Indeed, the latter are mainly employed in piloting mineral trains, and some of the former, it is stated, are now stationed at Toton for the same purpose. *Sic transit gloria mundi!* Class 2 embraces the 4–4–0 "rebuilds," both superheater and non-superheater, and Class 3 the Johnson 4–4–0 engines, or the present 700 Class. It is rather surprising that the superheater rebuilds have not been transferred into Class 3, as with their 20½ in. cylinders they are capable of just as good work as the Class 3 engines, with 19 in. cylinders, if not better. In Class 4 are placed the compounds and the 10 simple engines of the 999 type, identical in all respects save driving wheels and cylinder arrangements, while the latter are also all now superheated.

The loads are carefully calculated according to the speed of the train and the grading of the line, and the specified load of any one train may vary several times during its journey. Some of the allowances may be quoted, as indicating the comparative power of each locomotive type. The fastest trains on the main line, such as the 105-min. expresses to and from Leicester, are specified "150, 180, 200 and 240 tons," and the more easily timed trains, as the 8.0, 9.30, 10.5 and 11.30 a.m., 12 noon, 12.15, 4.30, 4.55, 6.0 and 6.30 p.m. *ex*-St. Pancras, "170, 200, 220 and 260 tons," for classes 1, 2, 3 and 4 respectively. The latter series are regarded as the maximum or "full" load for passenger trains. On the heavier grades of the Kettering and Nottingham line these figures are, with one or two exceptions, reduced by 10 tons, and on the very steep Hellifield and Carlisle section by 20 tons. There are further local modifications too numerous to refer to, but these illustrations are sufficient to show how carefully the question of loads has been gone into on the Midland Railway. In all cases, of course, "tare" loads are specified—that is the total



Photo] [*F. E. Mackay.*

GREAT NORTHERN RAILWAY.

2.20 p.m. King's Cross-Edinburgh express passing Holloway. 4–4–2 locomotive No. 281.

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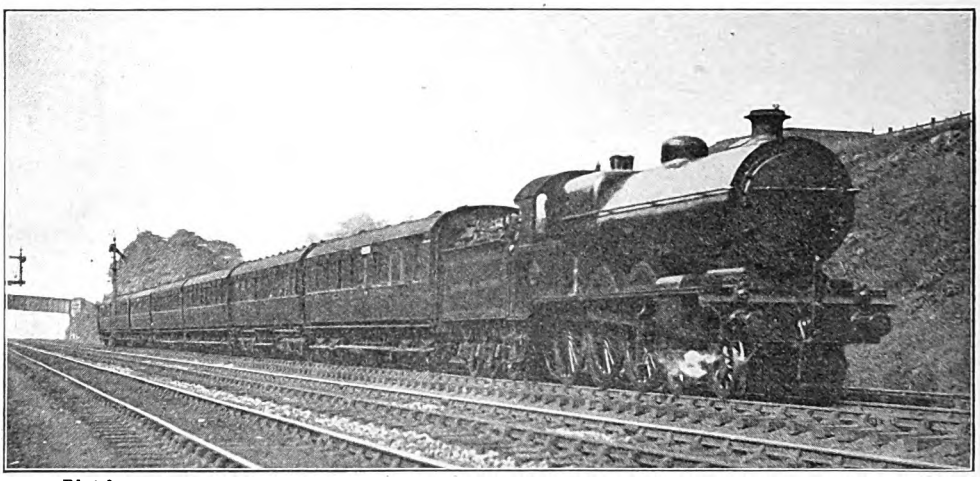
weight of the vehicles empty, as taken from the tablets at the end of each coach. One occasionally hears disparagement of both Midland and Great Central locomotive work on the score of the lightness of the trains, but it must be remembered that were the loads not moderate on each of these lines no such times as those scheduled could be observed at all. A moment's consideration of the table of "vertical rise" given in the June, 1915, issue will make this plain, both the Midland and the Great Central Railways —the last comers into London from the North—having the final, and therefore the worst, choice in the matter of gradients. This should be carefully borne in mind by the reader in his estimate of the performance now about to be described.

slack, due to colliery subsidences, followed by a recovery up 2 miles averaging 1 in 266, and 4 further at 1 in 357 to Royston Junction. There is then a descent of 5 miles at similar grades, succeeded by gentle undulations to Rotherham. It is, of course, the Normanton slack that creates the difficulty, and under these circumstances the booking of 41 min. for the 34 miles from Leeds to Rotherham by this train—on what is nominally the "crack," or lighter loading—becomes almost a "counsel of perfection." We will, however, look first at the runs on various trains which occupy columns 1 to 4.

On the first run, made with the 4.4 p.m. up Scotch express, a 7 ft. 0½ in. superheater rebuild did rather poorly, although with a net load only fractionally over the 200 tons



Photo] [*F. E. Mackay.*

LANCASHIRE AND YORKSHIRE RAILWAY.

Liverpool-Newcastle Luncheon Car Express passing Hebden Bridge.
4-6-0 locomotive No. 1512.

I will commence with a brief description of the runs given in table A, between Leeds and Rotherham, which are chiefly interesting in that the specified loads were exceeded in the majority of instances. The 1.0 p.m. express from Leeds to London, which figures in runs 5 to 8 inclusive, is, curiously enough, a habitual offender in this respect, and is the only train I know that regularly loads well above the specified maximum, and is scarcely ever piloted. That this particular exception should be made is curious, as this train sometimes loads very heavily indeed—*vide* column 8—and the route traversed is not of the easiest. The start is favourable to Methley, but from Altofts to Normanton there is an exceedingly severe

specified. Nearly 2 min. were lost to Normanton; at Cudworth the arrears had increased to 2¼ min., and a signal check beyond Darfield increased the loss to all but 5 min. at Rotherham. Sheffield was reached in 56 min. 57 sec.—52 min. allowed. After the addition of the Halifax coach, however, the same engine made some amends by taking the increased load of 245 tons from Sheffield to Chesterfield, 12¼ miles, in 20 min. 50 sec., start-to-stop, and from Chesterfield (start) to Trent, 26¼ miles, in 37 min. 55 sec., thus only losing ¼ min. on booked time. The maximum specified load on the former stretch is only 180 tons for Class 2 engines, and on the latter 200 tons. On the second run the train was the now suspended

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10.15 a.m. *ex*-Leeds, booked to pass Rotherham in 40 min., and here No. 745 did fairly well, with a load well over the specified 200 tons, to lose only 2 min. Sheffield was reached in 51 min. 37 sec. Run No. 3 was made on the summer non-stop express from Leeds to London, and is one of the fastest journeys over this stretch of line of which I have ever seen details. The load was within the maximum of 260 tons allowed, and over 1½ min. were gained to Rotherham, an exceptional feature being the time from Cudworth to Swinton, which involved an average speed here of fractionally over 70 miles per hour. No. 4 run was made on the up Scotch express leaving Leeds at 2.31 p.m., and as this train was running very late, it carried as far as Trent two extra through coaches for the West of England which should have left at 2.50 p.m. Although the load was certainly 55 tons above "full" load, the work on this run does not compare with that of the four journeys that follow it, and nearly 2¾ min. were lost on booked time to Rotherham. In continuation the 20 uphill miles from Rotherham to Clay Cross, inclusive of the severe slack at Tapton Junction, took 24 min. 20 sec., instead of the exceedingly difficult 22 min. allowance, but after that 3 min. were regained to Trent, making the total time for the 76¼ miles from Leeds 97 min. 9 sec., against 95 min. booked. Under the conditions of loading and the difficulty of the route, this was very fair work, as doubtless the water supply would have to be husbanded carefully in view of the inability to replenish the tender tank before reaching Loughborough troughs.

Runs 5 to 8, however, show the Midland compounds at their best. The booked maximum load for this train is 240 tons in the case of Class 4 engines, and the schedule times are 14 min. to Normanton, 26 min. to Cudworth, and 41 min. to Rotherham stop. Of the latter the first two are clearly impossible of achievement with such loads, and the added hindrance of a prolonged slack through Normanton. On the other hand the 15 min. allowance from Cudworth to Rotherham is unduly easy, and was improved on in every case. Engine No. 1000, which has now been rebuilt with superheater, and conforms exactly in external appearance to the Deeley compounds, was sluggish from the start, as is characteristic of many superheater engines while they are "getting their superheat." This is quite marked in run 5, and very much more so in run 8, although the load in the latter instance, of course, contributed to the time taken to pass Woodlesford. On run 5 the driver did not hurry at any point, only touching 64·3 miles per hour at Darfield, and lost ½ min. to Rotherham. Run 8, however, is noteworthy for a very rapid recovery of speed up Sandal bank—appearances, indeed, point to a rather higher speed than usual through Normanton—and some high speed was indulged in beyond Royston, the 11 miles from Cudworth to Parkgate being covered in 9 min. 53 sec., at an average speed of 66·7 miles per hour. It was really astonishing that with this tremendous load—135 tons over that ordained in the "rubric"—the loss of time on schedule was only 39 sec. No. 1007

TABLE A—MIDLAND RAILWAY: LEEDS-ROTHERHAM.

Distance.	Run No.		1	2	3	4	5	6	7	8
	Engine: 4-4-0 No.		416	745	1037	1025	1000	1007	1003	1000
	Class		2 (RS)	3	4 (C)	4 (C)	4 (CS)	4 (C)	4 (C)	4 (CS)
	Load (axles)		31	36	31	48	40	42	48	55
	" (tons)		215	240	220	315	280	290	330	375
Miles.			M. S.	M. S.	M. S.	M. S.	M. S.	M. S.	M. S.	M. S.
0	Leeds	dep.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6¼	Woodlesford	pass	9.55	9.23	—	9.27	9.40	9.00	9.00	11.25
11	Normanton ¶	"	16.56	15.38	14.18	16.01	15.25	14.50	15.12	17.35
14¾	Sandal	"	23.14	21.30	—	23.27	21.15	21.00	20.44	22.57
21	Cudworth	"	30.14	28.24	26.28	31.00	28.00	27.35	27.47	29.30
24¾	Darfield	"	†34.32	32.09	—	34.30	31.30	31.00	31.30	32.45
29	Swinton	"	40.37	36.30	33.18	38.31	35.40	34.50	35.51	36.28
32	Parkgate	"	44.15	39.42	—	42.14	38.50	37.50	39.33	39.23
			pass ¶	pass ¶	pass	pass				
34	Rotherham	arr.	46.56	42.02	38.26	44.40	41.30	40.10	42.29	41.39

R—Re-built 7 ft. C—Compound. S—Superheater. † Severe signal check. ¶ Service slack.

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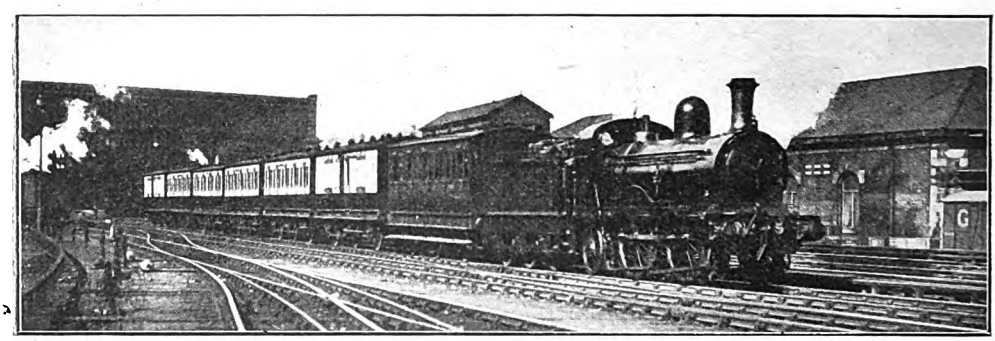
(Run 6) made the best time, starting very briskly, and gaining nearly a minute to Rotherham; the maximum sustained speed at Darfield was 67 miles per hour. No. 1003, a compound of the original Johnson batch, also started well to Woodlesford, but did rather feebly on the falling grades from Royston, and so lost 1½ min. to Rotherham. Such runs as these, however, show clearly that the larger Midland 4–4–0 engines are able to deal successfully, when necessary, with much heavier loads than the working time-table specifies.

I have details of several runs between Rotherham or Sheffield and Leicester or Nottingham, but the numerous hindrances to high speed, or even good locomotive work, on account of service slacks and cautions, make it hardly worth while to tabulate these. So we will "take up our parable" at Leicester, table B affording details of a number of excellent runs between Leicester and London. Certain of these are continuations of the journeys just described. Thus No. 10 run is the continuation of the fast London portion of No. 7, leaving Rotherham at 1.48 p.m., the lightness of the load—five eight-wheelers, including restaurant cars—being due to the cancellation of the Halifax and Huddersfield through coaches shortly after the outbreak of war. This is one of the only occasions on which I have known this train to be hauled by a Class 4 engine. No. 11 run is the continuation of the non-stop journey from Leeds to London commenced in column 3, while No. 12 continues behind a different engine and driver the run of the Scotch express that figures in column 4. The run shown in column 9 was one with the up Glasgow express leaving Trent at 8.16 p.m. for St. Pancras, and is chiefly of interest in view of the fact that the engine was No. 700—a Johnson 4–4–0 experimentally fitted with superheater and the Weir feed-water heater and pump. The train last mentioned has 2 min. extra to the working times shown between Luton and St. Albans, as an allowance for a conditional stop at the former town. In the last four columns of this table appear a series of runs on the 4.9 p.m. express from Kettering to London—a train even more tightly booked than the 105 min. Leicester expresses, on account of the inadequate allowance from Kettering to passing Wellingborough. To cover this initial 7 miles in 8 min. is quite impossible if the cross-over slack at Kettering South Junction is duly observed.

On the first journey (column 9) No. 700 started well from Trent, attaining a maximum speed of 63·4 miles per hour at Loughborough, and passing Leicester, 20¾ miles, in 23 min. 43 sec. The recovery from Leicester slack, with the consequent time of 28 min. 47 sec. thence to Kettering, was one of the best features of the journey, as the booking of 29 min. between these points is a very difficult one. The maximum speed at East Langton was 71·4 miles per hour, and the minimum at Desborough 41·1. Approaching Kettering a top speed of 77·5 miles per hour was touched, and the running thence to Wellingborough was very fast, the average speed between these points being 72 miles per hour. The work on from Wellingborough to Bedford must also have been very good, but the falling shades of night compelled my correspondent, who was evidently unacquainted with the "rail-joint" method of timing, to discontinue pursuing his researches on the subject of maxima and minima. Beyond Bedford, as



Photo] [*F. E. Mackay.*

MARYPORT AND CARLISLE RAILWAY.

1.30 p.m. Maryport train leaving Carlisle.

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no Luton stop was in prospect, the driver's efforts relaxed somewhat, and a comparatively "easy" run into town—according to Midland standards!—sufficed to effect a punctual arrival. The actual time for the 119¾ miles from Trent to London was 126 min. 26 sec. Run No. 10 suffers somewhat in view of the extreme lightness of the load, which even falls within "Class 1" capabilities. No. 1034 had run from Rotherham to Chesterfield, 16 miles, in 19 min. 48 sec.; Trent, 42¼ miles, in 51 min. 52 sec.; and Leicester, 63 miles, in 74 min. 31 sec. of, say, run 16, the journey from Leicester might have been completed in 98 min., and from Rotherham in 172½ min. The best times on this run were the 28 min. 42 sec. from Leicester to Kettering and the 20 min. 33 sec. from Bedford to Luton. There is remarkably close correspondence between runs 9 and 10 as far as Bedford.

Run No. 11 was a splendid journey throughout its length. The train was 10 min. late away from Leeds, and, as shown in column 3, Table A, a very rapid start was made, Rotherham being passed in 38 min.

TABLE B—MIDLAND RAILWAY: LEICESTER-LONDON.

Distance.	Run No. ..	Schedule.	9	10	11	Schedule.	12	Schedule.	13	14	15	16
	Engine No. ..		700	1034	1037		1041		1014	1018	1021	1012
	Class		3 (S)	4	4		4		4	4	4	4
	Load (tons) ..		28	20	33		†44		31	32	36	40
	,, (axles) ..		180	145	220		†285		200	230	245	270
Miles.		Mins.	pass	pass	pass	Mins.	dep.	Mins.				
0	Leicester ..	0	0.00	0.00	0.00	0	0.00					
3¾	Wigston ..	—	4.55	5.00	5.15	—	6.59					
10¼	Kibworth ..	—	12.15	12.00	12.52	—	14.52					
16	Market Harboro'	—	17.20	17.18	18.10	21	20.25					
21	Desborough ..	—	23.21	23.16	23.52	—	26.48					
27	Kettering ..	29	28.47	28.42	29.38	35	32.21	0	0.00 slack	0.00 slack	0.00 slack	0.00
34	Wellingboro' ..	36	34.37	34.50	35.30	42	†38.16 Sigs.	8	9.35	9.45	9.10	8.39
39¼	Sharnbrook ..	—	40.25	40.39	41.05	—	46.27 Sig. stop	—	15.30	15.45	14.35	14.20
49¼	Bedford.. ..	51	49.25	49.12	49.45	59	60.06	23	24.45	25.20	23.45	23.11 Sigs.
57¼	Ampthill ..	—	57.50	57.13	57.45	—	68.30	—	32.55	33.30	31.45	32.51
66¼	Leagrave ..	—	69.36	67.14	68.40	—	79.04 Sigs.	—	43.05	43.10	42.20	43.30
68¾	Luton	72	72.11	69.45	71.15	81	82.33	44	45.35	45.30	44.45	46.03
74¼	Harpenden ..	—	77.56	74.53	76.30	—	90.01	—	50.45	50.35	49.50	51.52
79	St. Albans ..	82	82.42	79.06	80.55	92	94.45	54	54.55	54.45	54.05	58.46
83¾	Radlett ..	—	86.47	82.42	84.32	—	98.39	—	59.05	58.50	58.30	62.35
86½	Elstree ..	—	89.37	85.17	87.08	—	101.22	—	62.05	61.45	61.25	65.06
92	Hendon ..	—	94.37	90.08	91.55	105	106.19	—	67.00	66.45	66.50	69.46
97½	Kentish Town ..	—	100.15	97.33	97.45	111	112.01	—	72.55	72.50	72.40	74.57
99	St. Pancras ..	104	102.43	100.32	100.35	115	115.00	76	75.30	75.40	75.20	77.32
99	Net times (min.)	104	102¾	100½	100½	115	105	76	75½	75¾	75¼	73

S—Superheater. † Less 4 axles (30 tons) slipped at Wellingborough.

(booked 73 min.),—decidedly sluggish work, as the train was behind time, and no serious checks had been experienced beyond the usual ones at Tapton Junction, Clay Cross, and Trent. After Leicester, however, ample amends were made, and although even then the work was not startling, time was steadily gained to St. Albans. A very easy finish from Hendon concluded the run. The total time from Rotherham to London was thus 175 min. 3 sec.—or 2 min. under schedule—but with the concluding times from Hendon 26 sec. From there the 16 miles to Chesterfield were covered in 16 min. 47 sec., inclusive of Tapton Junction slack, and inside the prescribed and difficult 17 min. allowance. The 26¼ miles from Chesterfield to Trent took 30¾ min. despite the usual Clay Cross slack and very moderate speed from Doe Hill onwards, while the 20¾ miles from Trent, passed very slowly, to Leicester were covered in 23 min. 20 sec., giving a total time of 109 min. 18 sec. for the 97 miles from Leeds. After this the running was

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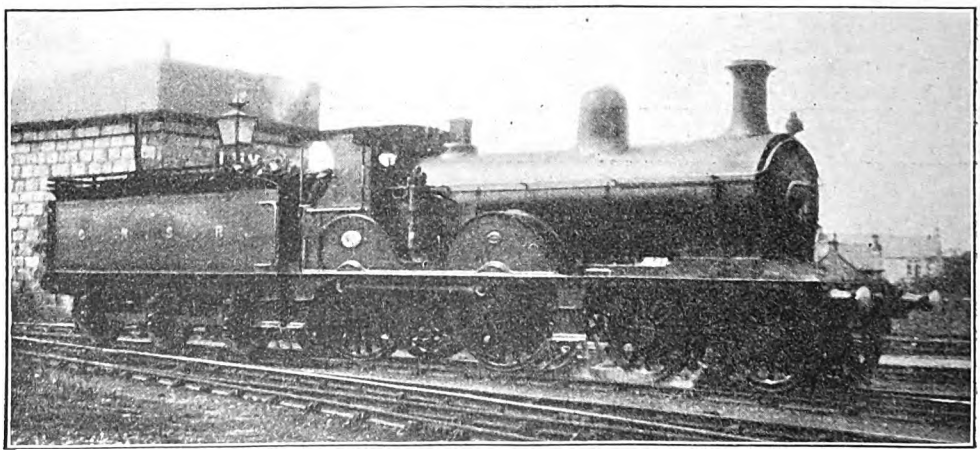
exceedingly good throughout to London, perhaps the finest time being that of 14¼ min. from Wellingborough to Bedford. The minima were: at Kibworth 50 miles per hour; at Desborough 41·7; at Sharnbrook Summit 43·5 (after 4¼ adverse miles, mainly at 1 in 120); at Ampthill 48·4; at Leagrave 46·4; and at Elstree 61·7 miles per hour. Some high maxima were also recorded, as 71·4 at East Langton, 75 at Kettering, 78·3 beyond Sharnbrook and 77·6 miles per hour at Radlett. From Leeds to London the total time was an excellent one of 3 hours 29 min. 53 sec.—more than 10 min. under the then schedule of 3 hours 40 min., and 3 min. less than the fastest booking this train has ever had, *i.e.*, 3 hours 33 min. From Rotherham to London it was 2 hours 51 min. 27 sec., and from Trent 2 hours 3 min. 55 sec. These are remarkably fine times with a load by no means to be despised, and over a road that, either by reason of grading, service slacks, or, in other parts, the necessity for running cautiously through colliery districts, is consistently difficult throughout. My correspondent remarks that no less than 18 min. were gained between Hellifield and London on this run.

The circumstances of Run No. 12 were somewhat disheartening for the driver, whose fine effort under these conditions was the more commendable. As remarked in connection with run 4, the 2.31 p.m. from Leeds to London was running very late, and so the start from Leicester was 40 min. behind time. But to such good effect did the regaining of time commence, that on passing Wellingborough, where a coach was slipped, 3¾ min. of arrears had been made up. Unfortunately, however, signals at Irchester were adverse, and this severe slack was succeeded by a dead stand between Sharnbrook and Oakley—where the speed normally rules very high—for 39 sec. Even these vexatious hindrances, as will be seen, had only occasioned a loss fractionally over a minute when Bedford was passed. A very fine ascent was made from Bedford to Toddington, and had it not been for still a third very bad signal check approaching Luton, the time from Bedford to Luton would have been the excellent one of 21½ min. The remainder of the run calls for no special comment; as will be seen, the time from Leicester to London, inclusive of all delays, was 115 min., or exactly as booked. It is difficult to estimate accurately a net time. From the average of the other compound-hauled runs in this table, the Luton check could not have cost less than 3¼ min., while on the same basis it does not seem unreasonable to allow 6¾ min. for the Irchester and Sharnbrook delays, leaving the net times from Leagrave to Harpenden, and Wellingborough to Bedford 7 min. 42 sec. and 15 min. 5 sec. respectively. This gives a net time of exactly 105 min. from Leicester to London, 72 min. 39 sec. from Kettering, and 51 min. 39 sec. from Bedford—a really first-class achievement with a load of these dimensions.

We now come to the series of runs 13 to 16 inclusive, which, from the hill-climbing standpoint, would want a good deal of



Photo] [*A. M. Willox.*

GREAT NORTH OF SCOTLAND RAILWAY.

Superheater 4-4-0 engine No. 77. Driver Alex. Davidson, of Elgin.

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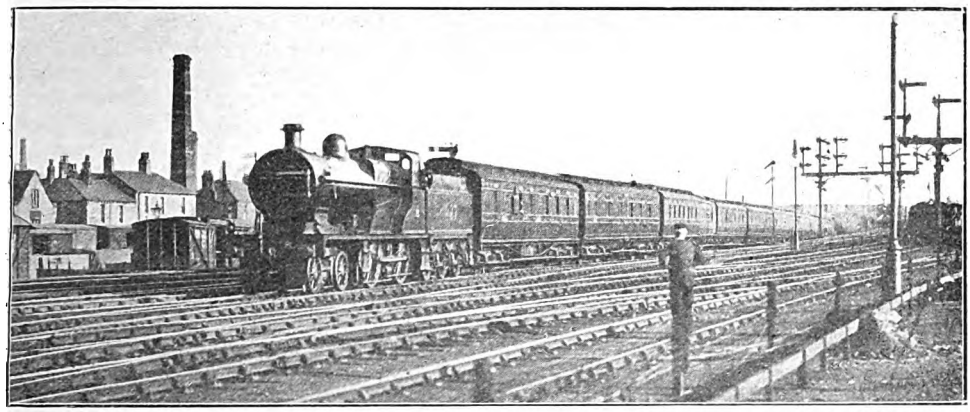

Photo] [*F. E. Mackay.*

MIDLAND RAILWAY.

9.30 a.m. Scotch express from St. Pancras entering Carlisle.
4-4-0 superheater engine No. 997.

beating. The first three are of my own timing, and the last reaches me from a friend. Good starts were made, despite the hindrance of the cross-over slack south of Kettering; on runs 13 and 14 a speed of 60 miles per hour was attained before Wellingborough, but No. 1021, by a brilliant effort, actually touched 69·2. Up Irchester bank No. 1014 fell to 46 miles per hour and No. 1018 to 44, but, brilliant as were these speeds, in consideration of the climb, No. 1021 did even more finely, not falling below 47·4 miles per hour on the 1 in 120. In all three cases, however, the "value" of Sharnbrook bank was lost on account of the moderate speeds that were attained in its descent, steam being shut off for most of the distance; No. 1014 certainly touched 75 miles per hour, but on neither of the other two runs was a rate of 71·4 exceeded, and in all three cases the speed fell to about 55 miles per hour after passing over Oakley troughs. Smart recoveries were made past Bedford, however, 1014 and 1018 both accelerating to 67 miles per hour at the Ouse Bridge, and 1021 to as much as 73·8. In fact, the start to Bedford on run 15 was quite the most brilliant feature of that run, and with a decent speed from Sharnbrook Summit we might easily have been through Bedford in 23 min. Each driver distinguished himself on the Bedford-Luton ascent, but especially Leigh, on run 14, his minima of 51·3 and 51·7 on the long 1 in 200 ascents to Ampthill and Toddington respectively entailing first-class work; his time of 20 min. 10 sec. for the 19½ miles' stretch (with a total vertical rise of 360 ft.) was indeed "some" hill-climbing. No. 1014 only fell to 52·9 at Ampthill, but the lowest speed at Toddington was 48·5 miles per hour, as was also that of No. 1021. The lowest rate at Ampthill on the last-mentioned run was 49 miles per hour. Some fast running was seen between Luton and St. Albans on each journey, the maxima on every occasion—with curious consistency—being 69·2 miles per hour at Luton and beyond Chiltern Green.

After St. Albans, however, the modesty of the downhill running was quite depressing. On run 14 we were on time, and easy running was excusable, but on run 13 the train only needed a gain of 2½ min. to be in on time, and on run 15, when we were treated to the feeblest display of all, with no higher speed than 66 miles per hour past Napsbury, the train was 12½ min. behind time. Had the train been on time in each case, however, it would be hard to find three more commendably consistent runs over that particular type of road on which consistency in running is the most difficult of achievement. A contrast in the matter of downhill running is furnished by run 16, on which delays prevented punctual running. The time from Sharnbrook Summit to Bedford was from 19 to 44 sec. less than those of the other three runs, while from St. Albans into St. Pancras, where a brilliant "sprint" was made, the time improved on that of runs 13 to 15 by an average of over 2 min. Moreover, the hill-climbing was well up to the usual standards. The Bedford-Luton time suffered somewhat by reason of the Bedford check,

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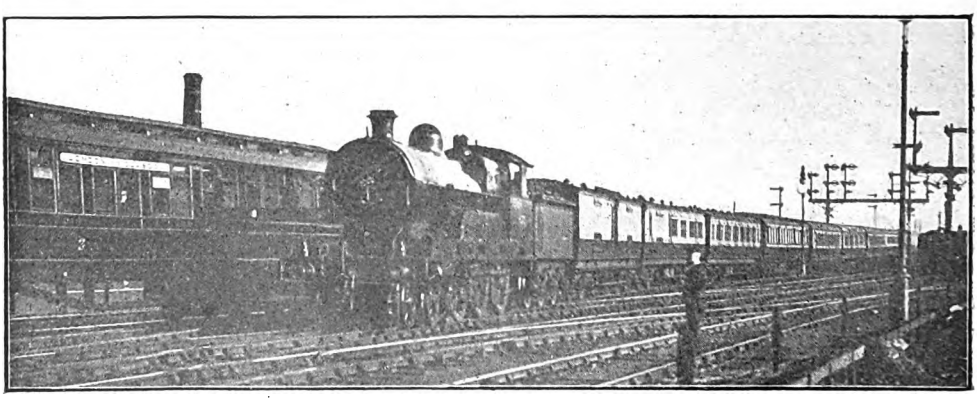
to about 40 miles per hour; this occurred actually just before passing Bedford, but the effect, of course, was mainly felt on the section immediately subsequent. But such times as 5 min. 41 sec. from Wellingborough to Sharnbrook Summit and 10 min. 39 sec. from Ampthill to Leagrave, were remarkably fine achievements with a load 30 tons above the maximum specified. So was also the exceptionally rapid start; the indications are that the Kettering South Junction slack was much less severe than usual or else that the train started from the fast platform at Kettering, and so did not need to slacken speed at all at the junction. The Harpenden stop—for what reason my correspondent was unaware—lasted about 1½ min., which is not included in the running time specified, and at a moderate estimate (on the times as tabulated) cost not less than 3¼ min. Adding to this 1¼ min. lost by the slack at Bedford, and the net time of 73 min. for the 72 miles is arrived at. Such work reflects very great credit on the driver concerned.

I have tabulated the West of England runs previously referred to, but as space is now all but exhausted, it will be necessary to postpone these, as also some on the Kettering and Nottingham line, a little while longer, and meanwhile I will content myself in conclusion by referring to one other run on the main line. A Blackburn friend sends some interesting details of a journey on the now suspended 1.30 p.m. Scotch express *ex*-St. Pancras. Compound No. 1032 was the engine concerned, with a load of 33 axles, or 215 tons full. A bank engine assisted in rear out of St. Pancras, and Elstree was passed in 17¼ min., the minimum speed through the tunnel being 49·5 miles per hour. The highest speed past Radlett was 67 miles per hour, and No. 1032 then went up the long incline past St. Albans without the speed falling below 52·3 miles per hour, the Cathedral town being passed in 24 min. 37 sec. from the start. Luton was passed in 35 min. 5 sec., and a characteristic descent to Bedford followed, speed rising to 73·7 miles per hour at Harlington, and 75 beyond Ampthill, before steam was shut off. Despite this easy running, however, Bedford was passed in 52½ min. from London, ½ min. early. Misfortunes now began, a prolonged slack at Oakley Junction, followed by a dead stand at Oakley for 3 min. 10 sec., causing the 10 miles from Bedford to Sharnbrook Summit to take no less than 18¾ min., instead of the more usual 11 min. or so.

From this stop the engine got away smartly, maintaining a rate of 38·3 miles per hour up the 1 in 119 to Sharnbrook Summit, and touching 75 on the descent to Wellingborough. So Wellingborough was passed in 76 min. 10 sec., or 68¾ min. net, and Kettering in 82¾ min., or 74¼ min. net. Another good climb followed, to Desborough, the lowest rate on this long and severe ascent being 45·9 miles per hour, and with a maximum of 73·7 on the succeeding descent, Market Harborough, 83 miles from the start, was run through in 94¾ min., or 87¼ min. net. Now came another bad slowing—for bridge repairs, near Kibworth—with the result that the final 16 miles into Leicester took 18 min. 20 sec. Thus 113 min. 5 sec. had been spent in covering the 99 miles from London to



Photo] [*F. E Mackay.*

LONDON AND NORTH WESTERN RAILWAY.

10 a.m. Express from Euston (Edinburgh portion) overtaking 9.30 a.m. express from St. Pancras when entering Carlisle station.
4-6-0 four-cylinder superheater engine, *Lord Kitchener.*

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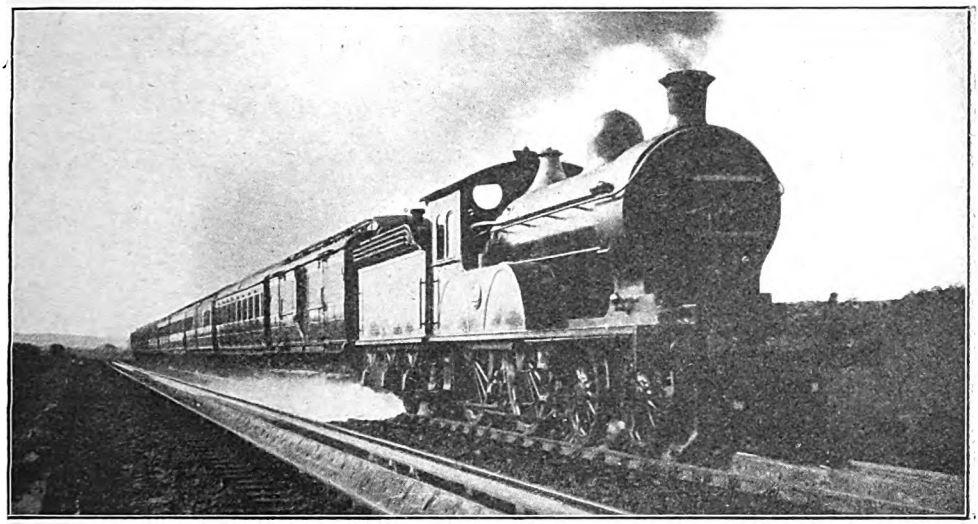

Photo] [R. J. Purves.

NORTH EASTERN RAILWAY.

2.20 p.m. Edinburgh-King's Cross express taking water near Belford.
4-4-0 locomotive No. 2029, Class R.

Leicester, but, debiting at least 9½ min. of this total to delays, we have the excellent net result of 103½ min., or 2½ min. under schedule. Perhaps the finest time of the whole run was that of 30 min. 20 sec. for the 27 miles from Kettering to Leicester, including the permanent way caution, slacks at Market Harborough and Wigston, and two severe stretches of adverse gradient.

No. 1032 continued to haul the train from Leicester, and, with a start 6¼ min. behind time, the driver recommenced his valiant efforts to "make good." A sustained maximum speed of 70·3 miles per hour was attained on the level from the start, Loughborough, 11½ miles, being passed in 13½ min., and Trent—very cautiously as usual—in 21 min. 10 sec. For this initial stretch of 20¾ miles 23 min. are allowed. The gradual rise beyond Trent was tackled in great style, the speed at Ilkeston Junction, up an average grade of 1 in 418–687–471, having risen to 56·3 miles per hour; the 1 in 190–258–290 on to Pye Bridge brought this down to 50·5, and the final 1 in 169–150–230 to Doe Hill Summit produced an absolute minimum of 46·8. Times over these three sections were 8 min. 55 sec. (6½ miles); 7 min. 40 sec. (7 miles); and 6½ min. (5¼ miles) respectvely. The usual slack was made at Clay Cross, and, with very moderate speed on the descent to Chesterfield, that town was passed in 52¾ min. from Leicester, the booked allowance for this 47 miles' stretch being 56 min. Further time was gained up to Dronfield, this 5¼ miles of steep ascent taking only 6 min. 40 sec., instead of the 8 min. allowed, while the lowest rate on the 4 miles at 1 in 100 was 32·6 miles per hour. Unfortunately signal checks ensued at Dore, and also beyond Heeley, otherwise the train would certainly have arrived on time, if not before time. As it was, the 59¼ miles from Leicester were covered in 70 min. 25 sec., even though scheduled 75 min., and the arrival was only 1¾ min. late. The net time was about 68 min., so that the driver had nearly 10 min. to his credit on these exacting times at the conclusion of the run. But this, after all, is characteristic of the majority of Midland performance; indeed, obedience to the injunction given to the traveller by the posters of that Company—"Travel by Midland for choice"—is not often regretted by the observer of locomotive performance.

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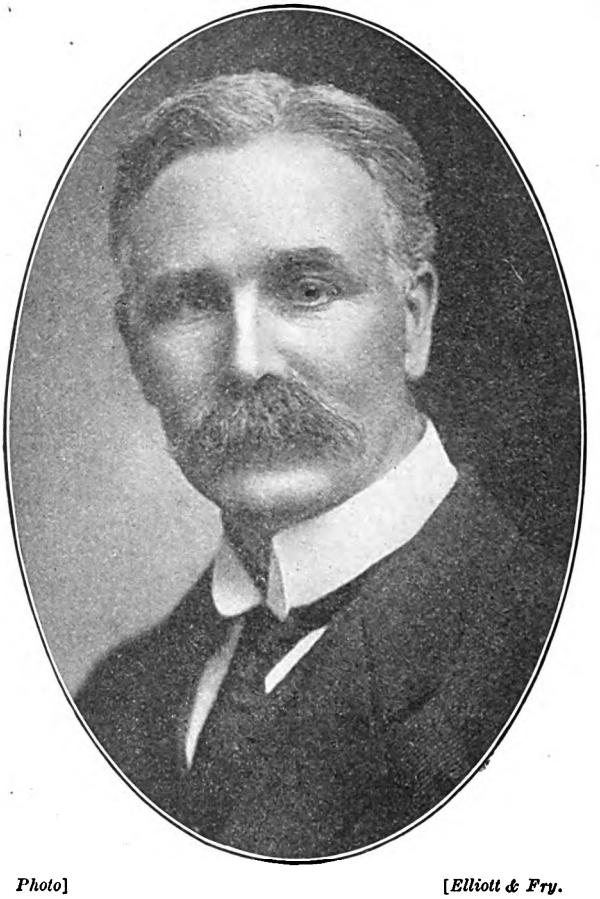
THE RAILWAY PORTRAIT GALLERY.



Photo] [*Elliott & Fry.*

MR. W. J. HOLLOWAY,

Mineral and Traffic Manager, Cardiff Railway.

MR. W. J. HOLLOWAY, who for the last six years has been Traffic Superintendent, has been appointed Mineral and Traffic Manager of the Bute Docks and Cardiff Railway, an office which merges the Traffic Superintendency and the Coal Shipping Department, the latter of which is relinquished by Mr. W. H. Rogers, Staithmaster, who has retired. Mr. Holloway joined the Company in 1880, serving eight years in the Collector's department, six years with the Dock-master, and thirteen years as assistant to the late Superintendent, upon whose death Mr. Holloway was appointed Traffic Superintendent. He is a native of Cardiff, and has spent practically the whole of his commercial life at the Bute Docks.

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Locomotive and Train Working in the latter part of the 19th Century.

GREAT WESTERN RAILWAY. [No. IV.]

The Last Years of the Broad Gauge.

By E. L. AHRONS, M.I.Mech.E., M.I.Loco.E.

(*Continued from page* 32, *January* RAILWAY MAGAZINE.)

IN the last number I stated that the earlier eight-wheeled broad gauge coaches were not "bogies." This is correct if by the term "bogie" is meant a four-wheeled truck swivelling about a centre pin in the usual manner. But a number of coaches were constructed in 1876 which had four-wheeled trucks at each end of a peculiar construction. They were arranged with two pivots, one on each side at the centre of each of the two truck side frames. The extent to which each truck could rotate to accommodate the wheels on a curve was limited by the range of oscillation allowed by the suspending links, a somewhat small amount, though considered sufficient for the Great Western main line. These coaches were 49 ft. long over buffers, and 10 ft. 1 in. wide over bodies. The compartments were 9 ft. 6 in. wide inside, and the weight was 18½ tons empty.

It is not my intention to go into any details of the former South Devon train services, as they hardly merit special mention. The best speeds have already been given.

It was on the Cornish section that one of the Swindon pupils, H. ——, made acquaintance with two of the most curiously assorted individuals thrown together as driver and fireman that it was possible to meet. H. joined the engine, a 4–4–0 saddle-tank without a cab, at Plymouth, on a journey to Truro. The engine driver was a tall, fine-looking elderly man who apparently had what a novelist might term "a mild grey eye." He was also the possessor of a wonderfully long flowing grey beard, which reached to his waist. H. seemed to think he was a Welshman, and he gave him the immediate impression of a druid. For sheer downright venerability he could have given any archdeacon then living points and a beating, but I very much regret to have to record that the resemblance to archidiaconal sanctity terminated with his outward appearance. Though long anterior to the days of locomotive superheaters, the druid was apparently provided with something of the sort at the back of his palate, for as soon as he was slightly upset, the flow of language that issued was positively torrid. The fireman was a short, thick-set and extremely dark individual who answered to the name of "Alonzo," and who looked the beau-ideal of a high-class brigand. One of his parents, it appeared, was Spanish, possibly an aftermath of the Armada. But in his case also appearances were very deceptive, for the brigand was in reality an excellent fellow, a sincere follower of the local Salvation Army, and to whom the druid was obviously a severe thorn in the flesh. They started with a train which, though it put in a considerable number of stops, had, nevertheless, to run fairly hard between stations. Going down one of the severe banks a pungent aroma stole on to the footplate, and the mild grey eye of the druid began to take on a steely glitter. There was no mistaking the source of the trouble; the piston-rod packing had seized and was burning. This occurrence took place shortly before the introduction of metallic packings, and the old form of hemp packing was in almost universal use in this country.

On stopping at the next station the druid seized a long oil feeder and departed with some unsanctified observations to the front

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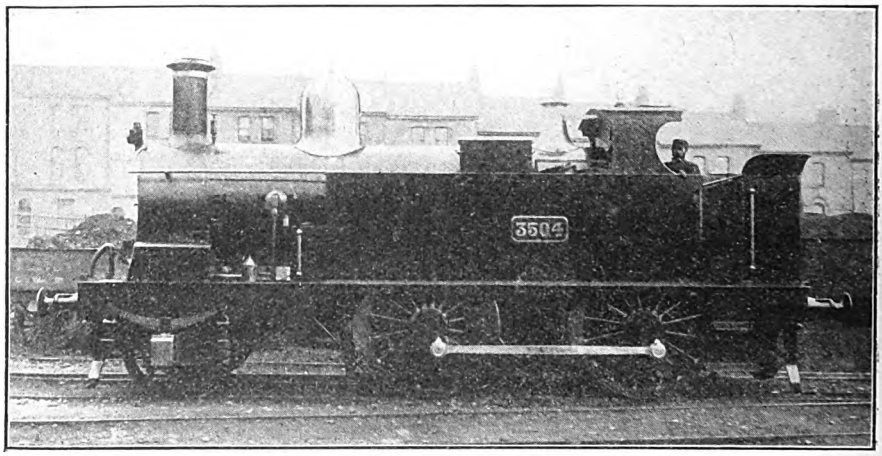
of the engine, where H., naturally interested, followed him. On seeing him, the druid turned round and asked sharply, "What the —— am I to do with this?" H. hazarded the opinion that the only thing to be done was to put plenty of oil on to the rod and gland, and get through to Truro. Then the old fellow opened his superheater to the full; the gist of his observations, minus the adjectives which adorned them, being that he knew all about that before H. came, and such information was a superfluous impertinence. "That's always the way with you young gentlemen from Swindon," he continued; "you come out along with me, and when anything goes wrong you know no more than I do how to put it right." So saying, he brandished the oil feeder and made several alarming passes with it close to H.'s face, so that the latter promptly came to a decision that it would be better not to wait, and executed a strategic movement to the rear in the direction of the footplate, inwardly, as he expressed it, thanking the original designer of tank engines that the coal bunker, where he took up a strong position, was not situated at the cylinder end of the engine.

Luckily at this moment the guard and stationmaster came up to say that they had been vainly trying to get the train to start, and that the guard proposed "putting one minute down to engine." This piece of information was hardly calculated to salve the druid's feelings, but the train had to proceed with the old fellow remaining on the framing in front, whilst the brigand took charge of the regulator and H. handled the shovel. As the train gathered speed, the side rods, which, on these engines without splashers, were visible from the footplate, rattled up and down, whilst the strong breeze wafted the Druid's long beard in all directions in front. Every few moments he would menacingly brandish the oil feeder in the direction of the footplate, whilst gusts of tropical language sufficiently strong to overpower the noise of the engine were blown down the handrail, whence they curled round the side of the weather-board on to the footplate. One more than usually fiery outburst moved the brigand to break silence with the remark, uttered with sepulchral solemnity: "I'm very much afraid, sir, that he is going to be d—d." Whether this prophecy on the part of "Alonzo" as to the old man's future state ever came true is not known, for H. left them at Truro, and having met neither of them again, he was unable from personal knowledge to give authentic particulars.



CONVERTIBLE SIDE-TANK ENGINE NO. 3504.

The last few years of the broad gauge were noteworthy for the number of "Convertible" engines, and perhaps a few words descriptive of these may be of some interest. With the exception of the few South Devon tank engines mentioned previously, the first of these "Convertibles" were the 0–6–0 tender engines 1206 to 1215, and the 0–6–0 saddle tanks 1228 to 1237, which had been altered from double-framed standard gauge engines about 1883. From the end of 1886, ten more 0–6–0 tender engines, Nos. 1196 to 1205, and forty more 0–6–0 saddle tanks, Nos. 1238 to 1257, and 1561 to 1580, were similarly converted.

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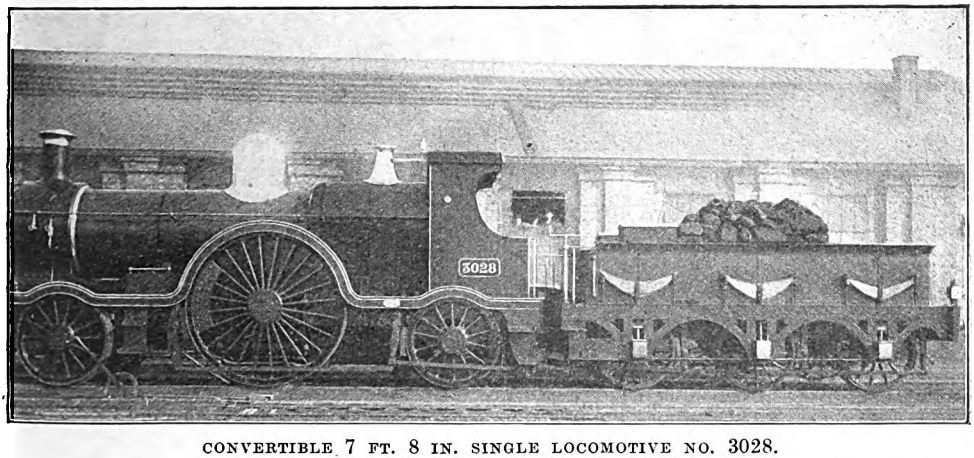
In 1885, ten 2–4–0 side tank passenger engines were constructed at Swindon with 5 ft. 1 in. wheels and 17 in. by 26 in. cylinders. Like the compound engine, No. 8, they had six frame plates, the leading wheels being carried in outside bearings. They were the first broad gauge side tank engines, for hitherto all the tank engines had had saddle tanks. In 1890 some of these engines, which were numbered 3501 to 3510, were altered to tender engines, and the side tanks removed. The tenders were old broad gauge stock, of which a number were always kept on hand at Swindon. The engines were also distinguished by the addition of ordinary splashers to the coupled wheels, which feature was very unusual in any broad gauge engine, whether "Convertible" or not. They are still at work as 2–4–0 double-framed mixed traffic engines.

"standard speed" for the 11.45 a.m. and 3 p.m. trains from London, but the up train was allowed 89 min. for the run, just as the "Zulu" was allowed 88 min., probably in order to time the arrival at Paddington at an even figure. The new features were the omission of the Bath, Taunton and Newton Abbot stops.

I believe it was this last non-stop run that was the cause of the alteration of some of the 3501 class tank engines into tender engines. Hitherto there had been no broad gauge tender engines capable of running an express over the 52 miles from Exeter to North Road. Certainly the few "Acherons" then remaining could not have done it, and the tank engines could not carry enough water. Engines 3502 and 3505 were the two first passenger tender engines to work a regular express service west of Newton Abbot.



CONVERTIBLE 7 FT. 8 IN. SINGLE LOCOMOTIVE NO. 3028.

These engines were altered to tender engines on the appearance of the new "Cornishman" broad gauge expresses, which made their *début* on June 1st, 1890, and there were from this date eight broad gauge expresses in each direction which departed from and arrived at Paddington. The new trains were timed as follows:—

	Down.	m.p.h.	Up.	m.p.h.
Paddington ..	10.15	53·3	7.50	52·1
Swindon ..	11.42 11.52	46·5	6.21 6.11	46·5
Bristol	12.45 12.52	51·5	5.18 5.13	51·5
Exeter	2.20 2.30	39·0	3.45 3.40	34·6
Plymouth (N.Rd.	3.50		2.10	

The down train was booked to run to Swindon in 87 min., this being the

The "Cornishman" expresses had a broad gauge career of just under two years, from June 1st, 1890, until May 20th, 1892, after which date they re-appeared as standard gauge trains. Between London and Exeter they were run by the 8 ft. singles.

The Convertible Compound engine No. 8 has already been fully described, so that I pass on to the next two 2–4–0 express engines, Nos. 14 and 16, which were the largest coupled engines possessed by the Great Western Railway for some years. They were built at Swindon in 1888, specially I understood, to take the places of the old Swindon pilot engines, *Acheron* and *Hauk*, and to run the heavy 3 p.m. up express from Bristol. Nos. 14 and 16 (the latter being illustrated) were very powerful engines, with 7 ft. coupled wheels and 20 in. by 24 in.

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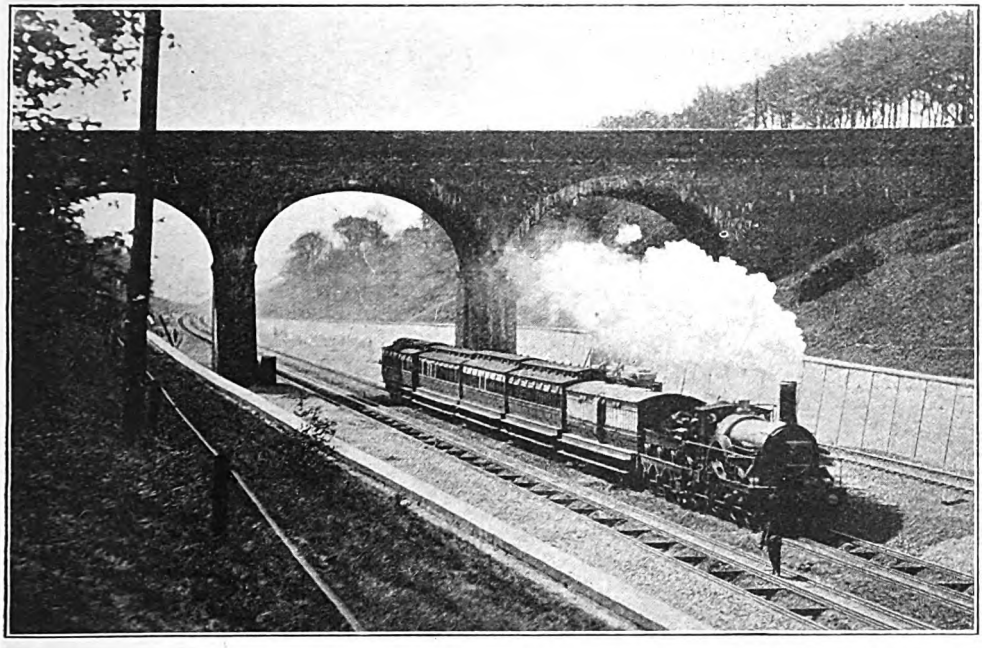
the smoke-box rivets countersunk flush, in place of the cupped heads which had hitherto always been used. The three new engines had a lifetime of rather less than four years, for, of course, they were not "Convertibles."

The next "Convertibles" to appear in 1888–9 were 0–4–2 passenger saddle tanks, Nos. 3541 to 3559, with double inside sandwich frames, 5 ft. wheels, 17 in. by 24 in. cylinders, and 180 lbs. pressure. The wheelbase of the coupled wheels was only 7 ft., and that from the driving to the trailing wheel 9 ft. 6 in. I believe these engines had a tendency to "wagging their tails" somewhat. The last engine of the lot, No. 3560, was therefore re-designed in certain details, and came out with short side tanks and a trailing bogie with Mansell's wooden wheel-centres. With the exception of six 0–6–0 tank engines of 1866, which had long since been converted to saddle tanks, No. 3560 was the only side tank engine on the broad gauge, other than the 3501 series.

The last "convertible" engines were constructed at Swindon works between May and August, 1891, so that they worked only for a few months as broad gauge engines. These single express engines had plate frames, 20 in. by 24 in. cylinders, 7 ft. 8½ in. driving wheels, 4 ft. 7½ in. leading and trailing wheels, 1,445 sq. ft. of heating surface, and 20¾ sq. ft. of grate area. They were the first Great Western tender engines, except the 8 ft. "singles," to be provided with raised fireboxes for many years. Of the ten ordered for the broad gauge, only eight, Nos. 3021 to 3028, were so built, the two remaining ones coming out as standard gauge engines at the end of 1891. I regret to say that I possess no records of their performances, or of those of the two large coupled engines 14 and 16. The 3021 class were stationed at London and Bristol and took their turns with the 8 ft. singles They were converted after the change of gauge to 2–2–2 singles, and subsequently, about two years later, to 4–2–2 singles.



THE LAST DOWN BROAD GAUGE EXPRESS FROM PADDINGTON.

When the final change of gauge took place, in May, 1892, there were 111 Great Western Swindon-built engines, and 21 South Devon engines of the Avonside Engine Company's build which were capable of conversion. Of these, the Swindon-built compound No. 8 and five of the South Devon engines were never converted. In addition to these, there were 67 non-convertible broad gauge engines still in existence which had to be broken up. Of the carriage stock, according to the *Great Western Railway Magazine*, there were 426 convertible coaches and 129 non-convertible.

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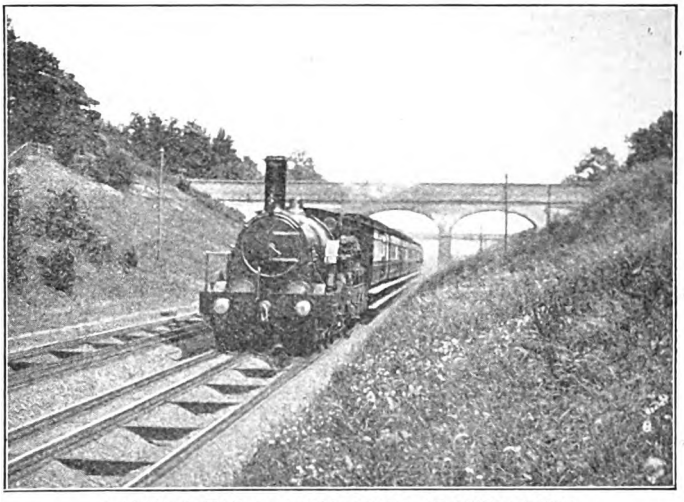

BROAD GAUGE EXPRESS TRAIN AT FULL SPEED.

The final abolition of the broad gauge took place on May 21st and 22nd, 1892. A very interesting account of this work appeared in *Engineering* for June 3rd, 1892, together with a considerable number of illustrations, and another very good description was given in the *Great Western Railway Magazine* for June, 1913, to which those readers interested should refer. From the latter account the following brief notes have been taken. A supply of narrow-gauge engines and rolling stock was sent to Exeter and to Plymouth, access to the latter town being obtained *viâ* the London and South Western Railway route over Dartmoor. As many of the existing broad gauge locomotives and rolling stock as could be spared were despatched to Swindon a few days previously and lodged on specially constructed sidings. The last through broad gauge train — the 10.15 a.m. "Cornishman" — left Paddington on Friday, May 20th, the engine being the 8 ft. single, *Great Britain*. The last up train left Penzance at 9.10 p.m. on May 20th, and reached Exeter at 4 a.m. on the 21st. As soon as it had passed, gangs of men proceeded to cut the "transoms" connecting together the longitudinal baulk sleepers, and moved the latter in to the 4 ft. 8½ in. gauge. It is probable that the fact that the greater part of the broad gauge was on the longitudinal sleeper system materially helped the progress of the work, for had the line been constructed on the usual system, with transverse sleepers and chairs, it would have been an even more difficult piece of work. At Plymouth and other places where there were a large number of crossings, the work was exceptionally difficult, for entirely new crossings and switches had to be used.

It was estimated that the cost of the change, including the scrapping and conversion of the engines and rolling stock, amounted to about £800,000.

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Photo] [*A. E. Goodfellow.*

GILLINGHAM STATION, LOOKING EAST.

The London and South Western Railway in North Dorset.

By "WESSEX."

WHEN the railway first reached Salisbury in the 'forties, it soon became apparent that it would not end there, as the vast district lying to the west of that city would naturally seek railway communication, too, and it was not long before a scheme for a railway from Salisbury to Yeovil was projected. This was in 1845, the promoters obtaining their first Act of Parliament in July, 1848. From one cause and another, chiefly through the financial troubles of that time, this was allowed to lapse, but an amended Bill eventually received the royal assent in August, 1854. In this connection it is interesting to relate that at that time there was no direct route from Salisbury to London, though one was planned *viâ* Andover, and finished in 1857. There seems to have been a delay of some eighteen months in commencing the Yeovil line, or else the whole stretch of line from Basingstoke would have been completed the same year.

The Salisbury and Yeovil Railway, though not passing through a populous country, has several noteworthy features. Indeed, even if it served no local population whatever, it is of vital importance in forming a link of one of the great trunk lines. It constituted, in fact, one of three originally separate and independent undertakings connecting Basingstoke and Exeter, and this eventual importance was clearly foreseen by the early directors of the youthful London and South Western Railway, as they subscribed a substantial proportion of its capital and obtained powers under its Act to purchase the undertaking at some subsequent date. This comparatively small railway, though passing through a somewhat remote and sparsely populated country, achieved the most remarkable prosperity and remained independent for some years, paying dividends up to 14 per cent., before the London and South Western authorities exercised their powers and absorbed the undertaking. This remarkable success was the more noteworthy from the fact that at first its finances were very unfavourable, and it is said that on the day when the first sod was cut at Gillingham there was less than £5 standing to the Company's credit at its bankers. Its early

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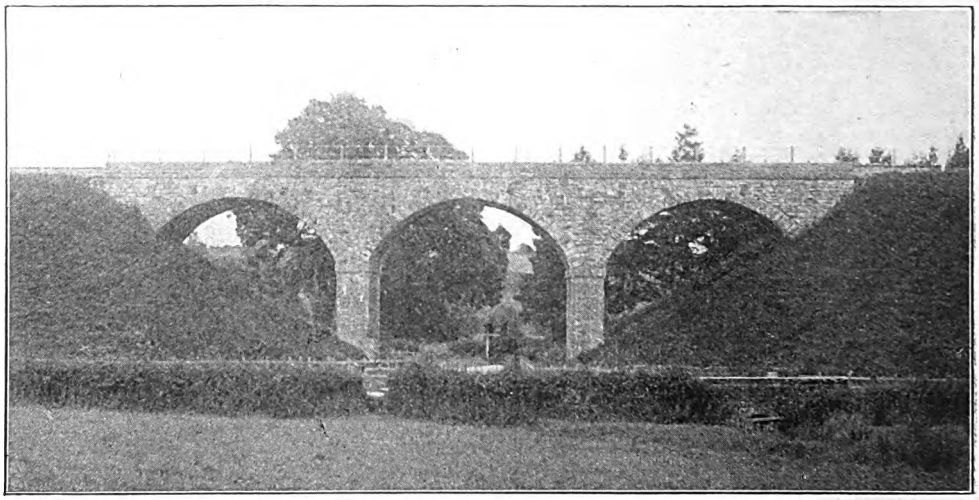
history was a stormy one, as it was involved in the battle of the gauges in Wessex, with the great powers of the broad gauge striving to keep the narrow gauge from advancing and controlling a fresh route to the far south-west. The result, naturally, was that its original capital was frittered away in severe Parliamentary struggles, leaving a sadly depleted exchequer to face the cost of building the line. This fact had a great influence on its geography and engineering aspects, necessitating economy in alignment and construction, and this was accentuated by the extraordinary nature of the country west of Salisbury. The engineers had to solve (if they could) how to avoid costly earthworks and at the same time serve established market towns *en route*.

the line had to be taken to Semley summit, 250 ft. above Salisbury and nearly 200 ft. above its next station, only four miles away. The Ebbe valley was an even worse case, as it had awkward access at its Salisbury end and its head reached a higher level than Semley. The valley is finally closed by an elevated tract of country which, after several miles of gradual rise, becomes a decided tableland, ending abruptly in a series of cliffs, with a magnificent escarpment facing the west and reaching a height of well over 700 ft.

On the very summit of this unique inland cliff stands a municipal market town, a small, compact, well-built little borough of some 2,000 inhabitants (though with suburbs it is nearly 5,000). Shaftesbury, one of the



Photo] [*A. E. Goodfellow.*

ECCLIFFE VIADUCT, GILLINGHAM.

The south-western corner of Wiltshire (as a great deal of that county) is a medley of irregular ranges of chalk downs and hills. These splendid rolling uplands extend in three roughly parallel ranges towards the west, assuming a severely aggressive attitude about the Dorset border, and attaining a height of over 800 ft., in majestic bluffs and knolls, often well wooded. In between flow the small rivers of the Nadder and the Ebbe, and the railway was obliged to negotiate one of these valleys; and the line of least resistance was chosen in the former, which, however, was not ideal, as it meant a climb of nearly 250 ft. somewhere in the next 17 miles, followed by a severe fall, as the ridge head of this valley attains an altitude of about 425 ft. Over this minor watershed

oldest towns in England, reputed to have been founded by one Hudibras, uncle of King Lear, in 950 B.C.; it was certainly a place of importance when the Salisbury and Yeovil Railway was built, being the foremost market and business centre between the Wiltshire capital and Yeovil, a matter of 40 miles. At one time this town possessed seven churches, a mint, and an abbey said to exceed Salisbury Cathedral in extent, besides other evidences of standing. Naturally there was a desire for the new means of communication to serve it, but the configuration of the country, which I have endeavoured to describe, will show the reader the difficulty of taking the railway there, as the town stands no less than 715 ft. above sea level and some 560 ft. above Salisbury and the corresponding

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Photo] [*A. E. Goodfellow.*

MR. SCETTRINO,

Until recently stationmaster at Gillingham, but now transferred to Yeovil Junction.

would not have made a good through main line, as it would have increased the distance to the west by about two miles, and would have had a big curve at Semley and a bad elbow curve in the offshoot from the high ground again. Moreover, the station would have been some 200 ft. below the town, with a somewhat steep gradient by road up to it.

These objections no doubt account for the fact that the claims of Shaftesbury had to give way to the greater importance of a trunk route serving the distant south-west of England. However, whether this was the stumbling block or not, the route was diverted several miles to the north, and was eventually planned to run in a straight line from near Semley for seven miles. Further difficulties necessitated a deviation of one mile further to the north, and this brought the line close to the village of Gillingham (otherwise that station would have been one mile on the Shaston road), and that village has grown to a flourishing market town, which expansion would undoubtedly have gone to Shaftesbury.

Upon leaving Semley the railway enters Dorsetshire and falls down a four-mile bank with a ruling gradient of 1 in 100, and some of the highest speeds attained on the London and South Western Railway are seen at Gillingham in consequence. Then comes a two-mile rise with the same key gradient to the next ridge, and we come to the famous Buckhorn Western tunnel, half-a-mile in length, there being a bank of similar steepness falling through it and continuing for nearly two miles beyond, including two quarter-miles steeper still at 1 in 90. A mile of level follows, crossing the lowland of the far-famed vale of Blackmore, and we leave Dorset after running through 9½ miles of this northernmost corner of that charming county (though the line again passes through a small corner at Sherborne), and reach Templecombe Junction after having commenced to rise again sharply. In the crossing of the three miles of the vale we see, apparently, another obvious economy in the construction of this railway, for nowhere is the line raised much above the bed of the valley. Usually one finds such a depression as this crossed by a high embankment, with a lofty viaduct over the actual river, and if the previous tunnel at Buckhorn Western had been about 600 yards longer and its eastern cutting deepened (it is extremely shallow considering the contour of the land at that point) the stiff banks at either end could have been materially eased, combined with, of course, a lofty embankment across the valley. But,

MR. HARRIS,

Now stationmaster at Gillingham.

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presumably, funds would not allow of the greater cost of such works, and hence we read that the cost of construction of the Salisbury and Yeovil Railway was only £16,400 per mile, or about one-half of the average cost of English railways, including, be it noted, the remainder of the London and South Western Railway itself. After leaving Templecombe, the up expresses, especially when heavy, as they usually are, have no chance of getting into their stride, or, at least, maintaining it for any distance till they have breasted Semley, 11 miles away. Just when they "get going," the abrupt 110 ft. climb to the ridge summit reduces their speed considerably, and the drop to Gillingham is not sufficient to enable them to regain their full swing before reaching the severe four-mile pull to the next ridge. Then again only a very moderate cutting is met with, and the line at Semley station is at ground level only some 250 yards from the edge of the ridge.

This is the station for Shaftesbury, and at the present day a smart motor-'bus serves the little town, meeting nearly all trains. This is a great boon, being so much quicker than the horse 'bus used for so many years, and practically places the town within 20 minutes, up the hill, and 15 minutes down, of the trains.

The staple industry is dairy farming, carried on to a considerable scale, and enormous quantities of its products are sent away by train from Semley and Gillingham stations, special trains being devoted to it daily to London.

There is a good service of trains to Semley, several having through carriages from Waterloo—the 3.30 p.m., for instance—and the ride up in the 'bus from the station is a never-failing source of interest, the road reaching an altitude of 805 ft., from which, needless to say, extends a magnificent panorama, including objects 30 miles distant.

In considering a station for the town, it is really a wonder a branch line was never built. Schemes have, of course, been proposed at various periods, including some of a light railway character, but none have so far attained measurable distance of realisation.

You are earnestly requested to hand in at any post office in Great Britain and Ireland all the magazines you can spare to be sent by organisations approved by the War Office and Admiralty to soldiers and sailors. No postage need be paid, and no wrapping is required.

We have received many letters from men in the fighting forces expressing appreciation of the "Railway Magazine," and it is hoped when you have done with this copy you will take advantage of the facilities provided by His Majesty's Postmaster-General.

There are over 100,000 men in the British Army and the Navy who in civil life were in railway employment.—Ed. "R.M."

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By Troop Train on the Darjeeling-Himalayan Railway.

By 2nd LIEUT. BRIAN BRAMALL.

(Illustrated from photographs taken by the author, who is serving with a battalion of the Middlesex Regiment, stationed in India.)

WHEN I read an article on the Darjeeling-Himalayan Railway, which appeared in the RAILWAY MAGAZINE many years ago, I little dreamt that I should ever experience for myself the delights of a journey on this truly wonderful little line. But the war, while bringing untold misery to thousands, has enabled many of us, who would never otherwise have had the opportunity, to see some of the world's grandest scenery and most interesting places, and in my own case, at any rate, this fact gives some consolation for our very natural and bitter disappointment at being sent to Calcutta instead of the Continent.

Darjeeling, as all the world knows, is most delightfully situated in the lower ranges of the Himalayas, about 7,000 ft. above sea level. Besides being the seat of the Bengal Government during the summer, it is the hot-weather "hill station" for troops located at Calcutta, Dum Dum, Dinapore and elsewhere. The barracks themselves are at Jalapahar, perched on a lofty and narrow ridge about 800 ft. higher than Darjeeling proper.

Scenery is simply superb. In every direction there are magnificent views over the stupendous mountains and valleys of the Himalayas, and over the plains of Bengal; while the climate in the early spring, and from October onwards, when I myself was stationed there, is all that can be desired.

It is not my purpose, however, to describe our stay in this fascinating spot. Suffice it that those of us who were at first most outspoken in our condemnation of India, were forced to modify our opinion very considerably after a visit to Darjeeling.

The station closes for the cold weather at the end of August, and we had orders to return to Calcutta on October 30. The morning of our departure was a particularly bright and sunny one—as is usually the case when one has to leave a delightful spot—and it was with the utmost reluctance that we paraded for the last time, and marched down, fifty strong, to Ghoom, the nearest station on the line.

Ghoom is the highest point reached by the railway—7,407 ft. above sea level. From here there is a drop of 600 ft. to the Darjeeling terminus, 4 miles further on. A considerable goods traffic is handled at Ghoom, which is a thriving, though rather dirty village. Good cart roads run from the station to the Nepal and Sikkim frontiers; and though the railway does not enter the territory of either of these independent states, Ghoom is in reality a frontier station, and a large traffic in goods of all kinds centres on it.

On our arrival we found three wagons in a siding provided for our "impedimenta." This had come down from Jalapahar in those curious, slow-going bullock carts which are such a feature of the country. The work of transferring the kit to the railway wagons was at once undertaken, and although this is a somewhat arduous task, it is one that never fails to provide amusement for those concerned in it. The placid bullocks apparently possess a keen, if misguided sense of humour. For they invariably move on when a heavy box is midway between the cart and the railway wagon; or playfully butt an unsuspecting soldier in the back, when his attention is fully occupied with carrying a cumbersome roll of blankets.

It was the intention of the railway authorities that our special should follow close on the heels of the down (to Calcutta) passenger train, due to leave Ghoom at 10.15 a.m. But "the best laid schemes o' mice and men, etc.," and when the passenger at length departed, half-an-hour late, we were informed that the engine deputed to haul our

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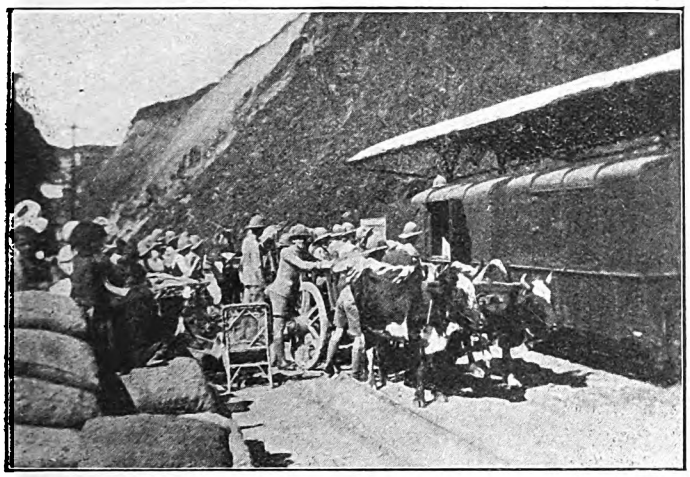


TRANSFERRING KIT FROM BULLOCK CARTS TO THE RAILWAY WAGONS AT GHOOM STATION.

train had "paraded sick" at Darjeeling. However, the wounded one was eventually successfully tinkered up. But it was well after 1 o'clock when we at length got away from Ghoom.

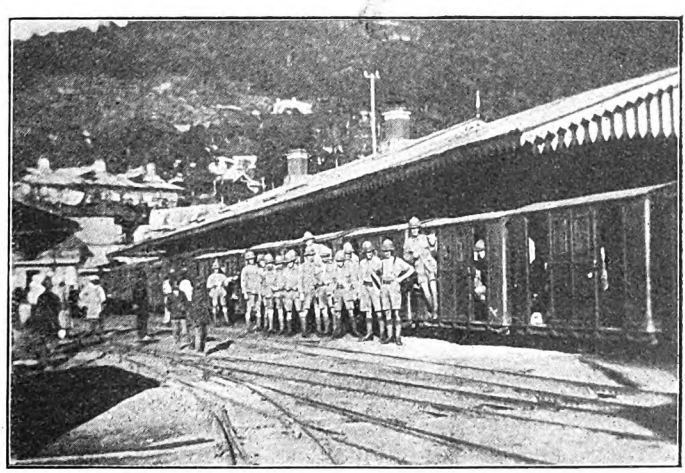
The train was composed of nine four-wheeled coaches, each with two compartments, and three steel covered-in goods wagons. Considering the smallness of the gauge—2 ft.—the carriages are remarkably roomy. There are practically no loading gauge restrictions, so that the rolling-stock can be built to "overhang" to the utmost limits of safety.

Our trusty steed was one of the standard 0-4-0 saddle-tank locomotives, with outside cylinders, built by Messrs. Sharp, Stewart and Co., of Glasgow. They are exceedingly powerful little machines and will haul a load of 50 tons up a gradient of 1 in 25 with ease. A curious feature of these engines is that, though they have to climb nearly 50 miles of very severe gradients, they are not provided with sand boxes. Instead, two natives sit on the buffer beam and, leaning forward, sprinkle the rails with sand as the train goes along.

Permanent way is most substantial for a 2 ft. railway. The rails weigh over 40 lbs. per yard, and the line is well ballasted with granite chips. No chairs are used, the metals being screwed directly on to the sleepers. As a derailment on the "khud" side might entail a drop of anything from 100 to 1,000 or more feet, the necessity for a well-laid line can be readily understood.

For the greater part of the descent to Siliguri the railway runs along the cart road, which it continually crosses and recrosses in order to take the easier curves. From Ghoom to Siliguri is one long coast of 47 miles, and except when starting, we ran the whole way with steam shut off.

The train runs twisting and turning along the mountain side, every now and then rushing over one of the numerous waterfalls which, I believe, cause the authorities considerable anxiety during the rainy season. It is indeed a marvellously constructed line, and that it cost £3,500 a mile to build is not to be wondered at. From my point of vantage, in the rearmost carriage, I could see the whole of the train first on one side and then on the other. The soldiers were leaning out of the windows all down the train and were obviously immensely enjoying the novel journey.



A 15-MIN. STOP AT KURSEONG, 4,864 FT. ABOVE SEA LEVEL.

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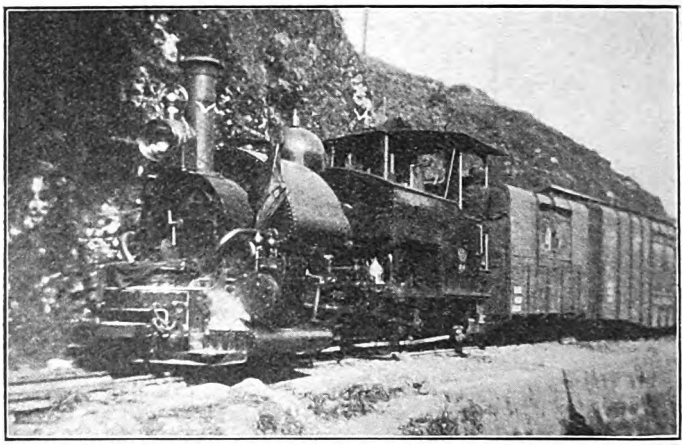

"OUR ENGINE."
Note the umbrella alongside the smokebox.

Large tea plantations, with their neat little red-roofed buildings cover the slopes of the less precipitous hills. The atmosphere was amazingly clear, and on every hand we obtained the most glorious views over the vast plains of Bengal, flat as a billiard table, and stretching for miles upon miles. Numerous rivers, looking like silver streaks, could be traced for prodigious distances. On several occasions one looked directly down from the carriage window to the bottom of some stupendous valley—perhaps 2,000 ft. below—and it was comforting to think that accidents on the line (or rather off the line) were rare.

Fairly frequent stops were made at the wayside stations, and the troops and the villagers on such occasions were objects of mutual interest and, no doubt, admiration.

At about 3.45 p.m. we reached Kurseong, and by that time had descended nearly 3,000 ft. Here the train has to shunt into the station, which is a terminus. Kurseong is a rapidly growing hill station and the largest place on the line between Siliguri and Darjeeling. A stop of a quarter of an hour enabled us to sample the goods provided at the refreshment room, and as the men had only received their pay the day before, a thriving trade was carried on for a while. But we were soon off again on our wonderful journey.

The sun was now well on its way to the horizon and was turning the mountain summits into gold, and the valleys into every conceivable shade of purple and green. Every moment the plains grew more distinct, and by this time there was an appreciable rise in the temperature.

At about 1,000 ft. below Kurseong there is a remarkable piece of engineering. The mountain side is too steep for a continuous descent, so the line "reverses" several times and zig-zags down the hill, the engine alternately pulling and pushing. These zig-zags are locally known as the "Ghoomp-ties."

Further on, at Choonbutty, the line describes a double loop, the train running under a little bridge over which it has just crossed. With a fairly long train it would have been possible to drop a biscuit on one's own engine driver!

For the last 2,000 ft. the train runs through a dense jungle which completely shut out the fast-failing light. A stop was made to allow the driver to light a huge flare on the roof of his cab—very similar to those used by costers at home. Whether this is to scare away the big game which are said to abound in the district, or merely to act as a searchlight, I cannot say, but the effect was most weird.

The remainder of the journey was uneventful and we at length reached Siliguri at about 7.30 p.m. Here our wonderful mountain journey came to an end, for Siliguri is the terminus of the Darjeeling railway, and the journey to Calcutta is continued by the Eastern Bengal State Railway metre gauge. At Santahar Junction, where we arrived about 4.30 next morning, there is another break of gauge—from metre gauge to broad (5 ft. 6 in.) gauge. Both at Siliguri and at Santahar the laborious job of transferring the kit from train to train had to be undertaken, and it will be an immense blessing to all when the broad gauge is continued through to Siliguri.

From Siliguri we had a 4–4–0 engine, built by the Vulcan Foundry Co., and a train of ten bogies. The scenery from this point onwards is monotonous in the extreme, the only feature of note being the new Sara Bridge over the Ganges. It is noteworthy chiefly for its tremendous length, and difficulties surmounted in its construction, rather than for height above water or size of span.

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An Old Time Tube Railway.

By W. E. EDWARDS.

THE all but forgotten system of atmospheric propulsion, as applying to railways, has naturally received attention in these pages, two articles having already been devoted to that subject. Of these, the first appeared in Vol. XIII., page 444; this relating to the method once associated with Christopher Nickel. In August, 1907, the actual application of atmospheric traction upon the Sandicote and Dalkey section of the Dublin and South Eastern Railway was next described and illustrated in some detail. The present writer's intention is, therefore, to supplement these contributions by furnishing details and illustrations not hitherto forthcoming, and relating, for present purposes, to the earliest known system.

"An idea cannot be patented," so it is truly said, and as with most inventions, the actual originator of atmospheric propulsion is hard, indeed, to seek, whilst of the list of patents, extending over a quarter-century, and exceeding thirty in number, nearly all relate, as is usually the case, to improvements upon methods which the genius of others has devised. So far as is known, the first name which may be associated with atmospheric railways, and, as it is highly interesting to note, with the system of "Conveyance of passengers through a tube," is that of George Medhurst, who first claimed attention by describing "A new method of conveying letters and goods by air," this relating, however, to a wind engine patented during 1799; followed by a second, granted one year later, for an "Improved Aeolian Engine." Yet twelve years later, a further publication appeared, when Mr. Medhurst (in 1812) announced "An improved method of rapid conveyance of goods and passengers on an iron road through a tube of 30 ft. area, by the power and velocity of the air."

Papier, a contemporary inventor, also advocated the use of the "power of the atmosphere against a vacuum," while, in 1817, one Lewis proposed a like system.

The earliest registered patent is that of Mr. J. Vallance, of Brighton, whose specification was enrolled August 19th, 1824. Therein is described "A method of communication, or means of intercourse by which persons may be conveyed, goods transported, or intelligence communicated from one place to another with greater expedition than by means of steam carriages, steam or other vessels, or carriages drawn by animals"; nevertheless, the inventor recognises, as a known fact, the "principle of communicating a mere impulsive motion in one direction, that is, from a pipe to a piston in a cylinder at the other end of a pipe."

Turning to the illustrations. Fig. 1 is a cross section of the cast-iron cylinder or continuous tube, "extending between the places from and to which intercourse is to be effected," the internal diameter of the cylinder being 6 ft., with a thickness of $1\frac{1}{4}$ in. The tube is cast in 12 ft. lengths, the estimated limit of such castings at the period. Brickwork walls, running the length of the line, support the cylinder, as shown.

Fig. 2 is a side view, whereon an extra thickness of $\frac{1}{4}$ in. will be observed at either end, this being turned to a smooth surface, having a width of 3 in. At these extremities the internal bore is enlarged by $\frac{1}{8}$ in., and also bevelled off so as to produce a conical figure. Having been laid and bedded, the following method of uniting the various lengths is suggested: Each length to be placed at a $\frac{1}{4}$ in. distance apart, to allow for expansion, whilst over every joint must be wrapped a piece of thick flannel, 6 in. wide, and previously well soaked in hot melted tallow, the turned surfaces being thus covered by three or four thicknesses. Over this flannel must be placed a wrought iron hoop of $\frac{1}{4}$ in. thickness to cover the joint, the hoop consisting of two parts connected by a hinged joint, having a powerful nut and screw which so presses the greasy flannel upon the iron, that a joint so secure, the inventor estimates, would result, that the air within the cylinder might be exhausted to a degree which will lower a barometer several inches without leakage, that being deemed as a sufficient approximation to a vacuum.

At the base of the cylinder, as shown in Fig. 1, is a groove, or channel, for a wheel to run in, "something similar," Mr. Vallance states, "to those of a railway," while the inside of this track, at every joint, must be

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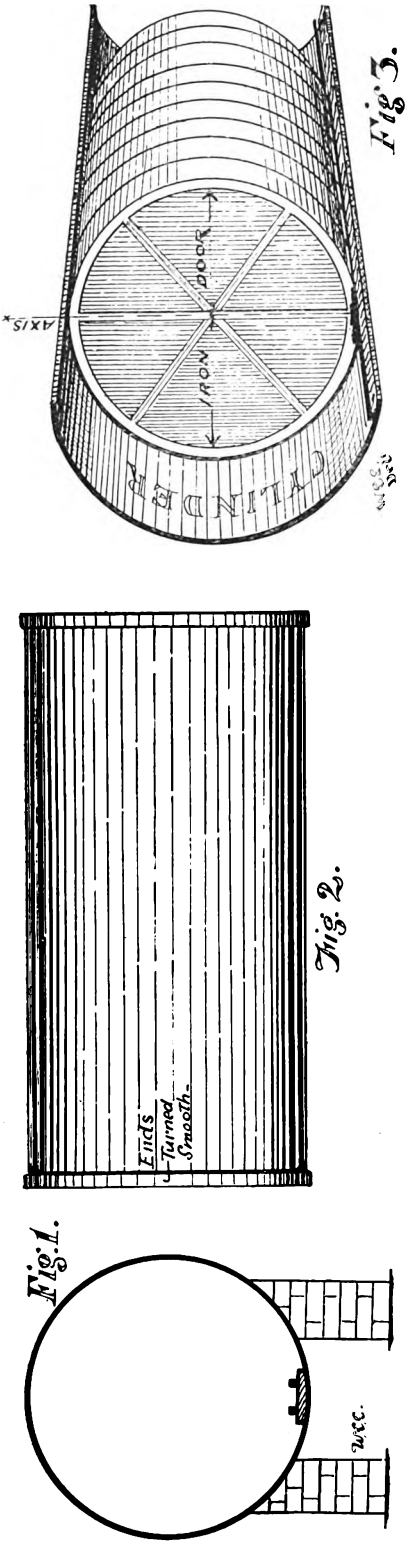

FIGS. 1, 2 AND 3, SHOWING MR. VALLANCE'S SYSTEM OF ATMOSPHERIC TUBE RAILWAY.

rather wider, or bevelled off, "to allow the wheel to pass from one to the other without striking the end." Provision, the specification directs, must be made against the interposition of brooks or rivers over which the cylinder might be carried by bridges, and, in cases of gradients, "variations must commence at such distance from the point as to admit of their being rendered gradual." Having such in view, it was provided that a double, or triple, thickness of flannel be employed, and so soaked in tallow that the pores throughout its substance might be filled, thereby securing a tight joint, as required elsewhere.

Fig. 3 represents a portion of the cylinder, as well as the vehicle contained therein, accommodating, as the inventor proposed, either goods or passengers, its cylindrical outline so conforming to that of the tube itself as to render the carriage, in fact, a travelling piston. That being so, the vehicle is, of necessity, sealed; this being accomplished by means of iron doors at the ends, one of which appears in the sketch. Fig. 4 explains the suggested construction of the carriage. A and B are timbers 12 ft. long, having widths of 6 in., with 2 in. thickness. C and D are similar timbers, 4 ft. in length, secured to A and B by mortises. A space of 12 in. exists between C and D. This frame, represented at the upright position, must be placed against another of precisely similar construction and bolted thereto, allowing, however, a 4 in. clearance betwixt the frames. Within that space, at the terminations of A and B, are iron castings, as indicated in side view at X. A top view of the frames, showing again the position of the castings, is seen in Fig. 5. Saving the outer shell, this Sandwich framing constitutes the vehicle, together with the single wheel, illustrated both by Figs. 4 and 5, upon which it was proposed to run the carriage, the purpose being to thereby diminish friction, as well as "to admit of the vehicles being more easily moved and better adapted to variations from the right line," whilst, in order to keep the carriage upright, small rollers were added, although, as the inventor observes, the single wheel sufficed for running purposes. "But as the rate at which this vehicle is to move is beyond the common, and a carriage in rapid motion very much shakes and jars what it passes over," it is added that, to prevent injury to the cylinder, "the motion needs to be softened," and to carry such into effect Mr. Vallance advocated the following

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extremely ingenious and hitherto unknown device, which further reference to Fig. 4 may explain. A, B, C, and D, as before noted, represent the framing of the vehicle. E is one of a pair of 12 in. gun-metal cylinders of ½ in. thickness, their positions, as viewed from above, being additionally indicated by circles in Fig. 5. F is a piston-rod, carrying a link for the reception of the wheel axis. G is an iron casting of which a—a (above) is an edge view. This casting was contrived to slide up and down between the timbers C and D, being also pierced by a hole receiving the axis of the wheel. It was then proposed to attach to the carriage a condensing air-pump, having a pipe for admission of air to the cylinders, the pressure of that air acting (upwards) against the cylinder top, and (downwards) against the piston, and by such movements the cylinders and framing were to be "borne up in the manner of an elastic medium," supplying, as it was claimed, "the springs of a coach and diminished concussion with a precision that no other method will approach to." "Air," it is added, "is one of the most elastic media we know, and it requires but condensing to the proper degree to render the pressure against the cylinder top so exactly the counterpoise of the weight of the frame as to admit of its sinking and rising . . . it is but increasing the condensation from ten to one hundred pounds an inch to render springs which at one time are exactly adapted to a load of one ton, in the next minute adapted to a load of ten tons," and so forth.

The running wheel, as will be noted by Fig. 4, extends below the framing, the wheel being thus kept clear of the track. The suggested method of driving the air pump, which supplied condensed air to the cylinders, was to connect it by small wheels and machinery to the axis of the wheel carrying the vehicle, this rotatory movement maintaining the pumps action, while it was proposed to attach a safety-valve, loaded to the required degree of condensation, at the top of the cylinders.

Fig. 6 is a sectional view of exterior of the vehicle, which was thus constructed: To the frames were attached circular rims of elm or ash, formed of segmental pieces in two thicknesses, glued and fixed with the grain crossing. These ribs were nearly the size of the main (6 ft.) cylinder, and an attachment was effected, as noted, with the top and bottom of the sandwich framing. At the base a piece is cut out, as shown, to allow of passage over the wheel track.

The inventor's intention was to board the circular ribs internally "so as to render them capable of holding goods (and incidentally passengers !) like the hold of a ship, the pieces a-a (as on Fig. 6) projecting from the bottom and top like the keel and beams of a vessel." The ends of the carriage, as stated, are sealed by the cast-iron doors shown in Fig. 3, "so that the air may act against them, and drive the carriage forward." The doors consist of a rim, radii, and a hollow diameter piece for the reception of an axis as indicated, their movement being similar to that of the disc signal. The spaces between the radii are filled with sheet iron, so that the door, in turning on its axis, seals the vehicle "saving for the crevice left all round between the circular door and the internal boarding of the carriage." Turning again to Fig. 6, it may be noted that to the end ribs are attached rollers at R, their purpose being, as before mentioned, to maintain the vehicle at the vertical position within the main cylinder, so concentrating the weight upon the single running wheel already described. "Wherever desirable," however, the inventor proposed the adoption of a second wheel, "placing them one at each end of the vehicle, as the wheels of the velocipedes were placed, that they may both run in the same wheel track."

The suggested method of stopping the vehicle is one which would scarcely commend itself to the Tube passenger of to-day! It is directed that the aforementioned iron doors (sealing the ends of the carriage) be "moved on their centres so as to place them at right angles with the position in which they stand, causing them to be with their edges in line with the vehicle, which has a similar effect to that of lowering the sails of a ship, as the air then passes through the vehicle instead of acting against it," while, in order that the velocity may diminish gradually, the operation must be carried out "some time before it is intended to stop." Foreseeing, however, that this method might, upon occasion, be inadequate, brake power needs be supplied as follows. Within the vehicle a lever is provided, working on a bolt passing through the top pieces "a" (shown in Fig. 6), one end of which lever is so fitted as to "rise and rub against the top of the cylinder." The latter is "marked or numbered with white paint at every mile," and "lights being carried in the vehicle, it is known when to open the ends," or apply

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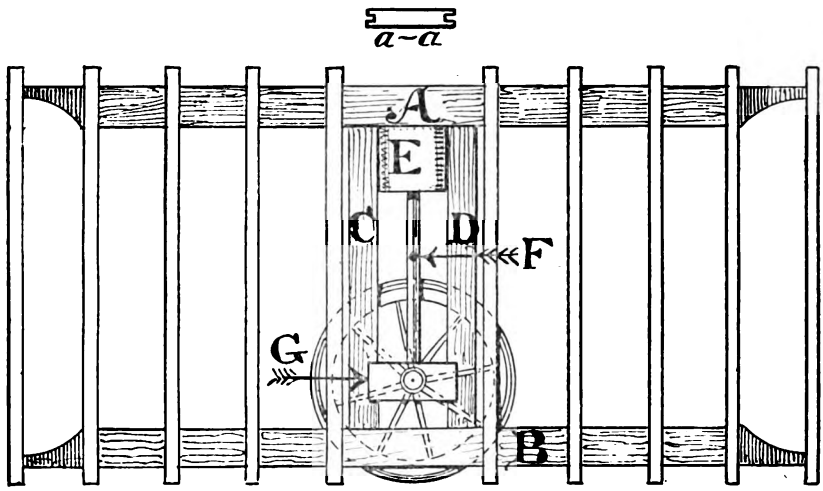

Fig. 4.

Fig. 5.

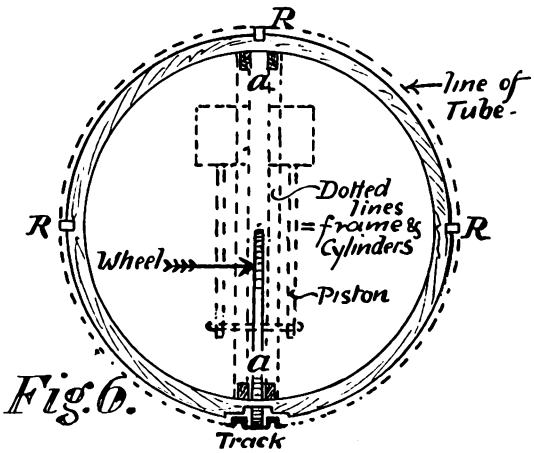

Fig. 6.

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the above-mentioned brake, as might be requisite. In loading the vehicle, "care must be taken to adjust the load so that it may balance on the wheel as near as may be that the friction may be concentrated on the wheel."

It has been noticed that between the circumference of the car and the containing cylinder is necessarily a space, amounting, however, to no more than one-twentieth of an inch. In order, therefore, as far as possible, to seal this aperture without causing friction, it was suggested that strips of bear's skin be affixed at either end of the vehicle, supplying a medium which will "so impede the passage of air as to render what does get in of little consequence."

From the foregoing it will be gathered that air pressure was the medium contemplated as motive power. Accordingly, "immensely large" air-pumps are required at the cylinder ends, or terminal points of the railway, driven by steam engines of proportionate power, each pump being fitted with two valves, rendering them exhausting, or condensing, pumps, as circumstances demanded. Thus air is either pumped into the cylinder, or exhausted therefrom, the resultant effect being either that of propelling the vehicle by the creation of a vacuum in advance of it, or by a contrary action of the pumps, exerting the force of a plenum at the rear of the carriage.

Calculated upon the basis of 7 horse-power, with movement of 220 ft. per minute by the pump pistons, a speed of 10 miles an hour is estimated as practicable by the inventor. Several interesting details, such as an ingenious system of mercurial air valves actuated, when requisite, by the passage of the vehicle, by a contrivance much on the lines of the modern "trip cock," are necessarily omitted from this outline description, and although the invention in question apparently never passed into practice, its author's name, when atmospheric railways became, two decades later, an accomplished fact, again figured prominently amongst those associated with that short-lived but, for the time being, not wholly unsuccessful system, and which it is, moreover, interesting to note, received the support of several railway engineers of eminence.

The inventions under consideration include an entirely new method of telegraphic intercourse upon similar lines; that is to say, a pipe of $1\frac{1}{4}$ in. diameter is laid underground, following the course of the tube railway above described. By the use of cylinders and pistons at either terminal point, a column of water is so directed along the course of the piping that, by means of an alphabetical code, letters or figures may be thereby indicated, and, as the inventor adds, "the necessary operations at each end of the tube may, notwithstanding their distance, be simultaneous, and enable us to inform those who direct operations at one end when the vehicle is ready to start from the other, that the pumps may be set going at the proper time, and errors or accidents prevented."

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A New London and North Western Railway Ambulance Train for Home Service.

AT an early stage of the war four ambulance trains for home service were equipped by the London and North Western Railway, and now a further train has been completed at Wolverton, and under the direction of Mr. H. D. Earl has been prepared for use here in amplification of the trains already available, and which have rendered so exceptional service during the past sixteen months.

The design is generally similar to that of the trains originally equipped, but various improvements are included.

Ten vehicles comprise the complete train, which will accommodate about 120 lying down cases, or a larger number if they are capable of sitting up; this is in addition to providing for a staff of about sixteen. The beds in the ward cars can be arranged for lying down cases or for patients who can sit up. When the cars have been used the beds can all be folded flat against the sides of the vehicle, so that it can be thoroughly cleaned out in a short space of time.

As an instance of how details have been studied, it may be mentioned that even the linoleum which covers the floor joins the sides of the vehicle in a manner which effectually precludes any dust remaining when the vehicle is cleaned after use. A steam-heating apparatus is fixed under each bed, and can be controlled separately to suit the various cases.

One of the ward cars has a portion which, if desired, can be screened off for the use of officers. A telephone is fixed so that prompt advice can be given from one end of the ward to the other of cases requiring immediate attention. With one exception the vehicles are lit by gas, and the burners are controlled separately.

In the pharmacy car is an operating table, portable lights, bath, etc. This vehicle is provided with a telephone. It may be mentioned that successful delicate operations have been performed in similar vehicles on other London and North Western ambulance trains.

The staff cars are fitted with dining and sleeping accommodation, and a kitchen car is also available for the needs of the patients, doctors, nurses, and orderlies. Bath-rooms are provided, whilst there are plenty of wardrobes and lockers, and a lavatory in each car.

In view of the notable success attending the ambulance train exhibitions already held, including that of one of the London and North Western trains intended for use in France, this new home-service train was exhibited during December at various provincial towns, including Northampton, Birmingham, Manchester, Leeds, and Blackpool. As in other cases, a charge of 1s. was made, the receipts going to the funds raised for the benefit of railway troops serving with His Majesty's Forces.

As a result of this exhibition £436 18s. was realised. Collection boxes placed in the pharmacy car contributed £46 0s. 4d. and dog "Bruin," whose services were again utilised, collected a further £12 0s. 6d. The total was therefore £494 18s., a very substantial addition to the funds for providing comforts for railway troops serving with the Expeditionary Forces.

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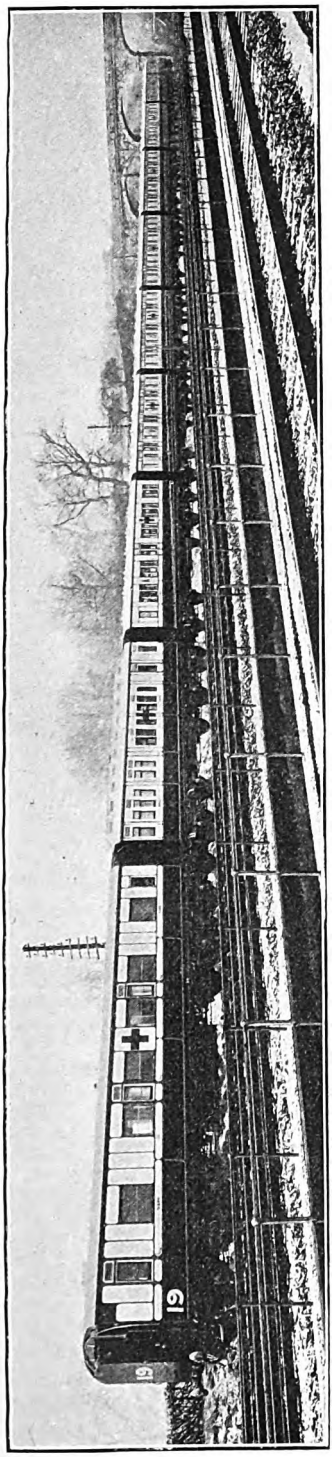
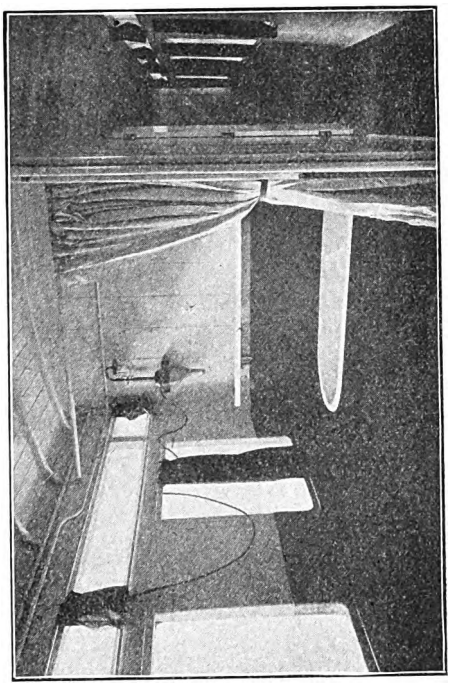
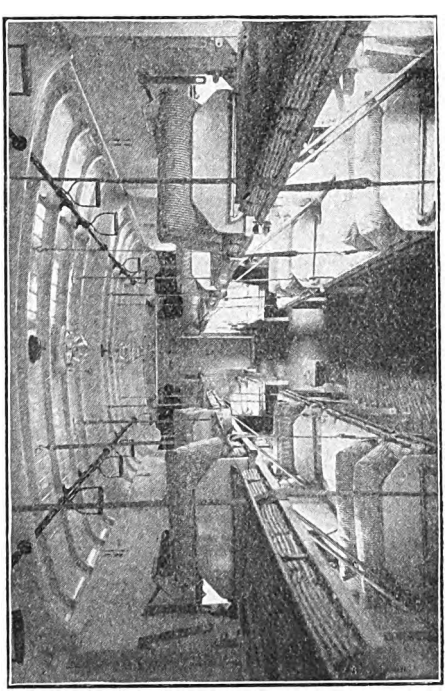
A NEW LONDON AND NORTH WESTERN RAILWAY AMBULANCE TRAIN FOR HOME SERVICE.



GENERAL VIEW OF AMBULANCE TRAIN AS EQUIPPED AT WOLVERTON CARRIAGE WORKS.



TREATMENT ROOM IN PHARMACY CAR.



INTERIOR OF WARD CAR.

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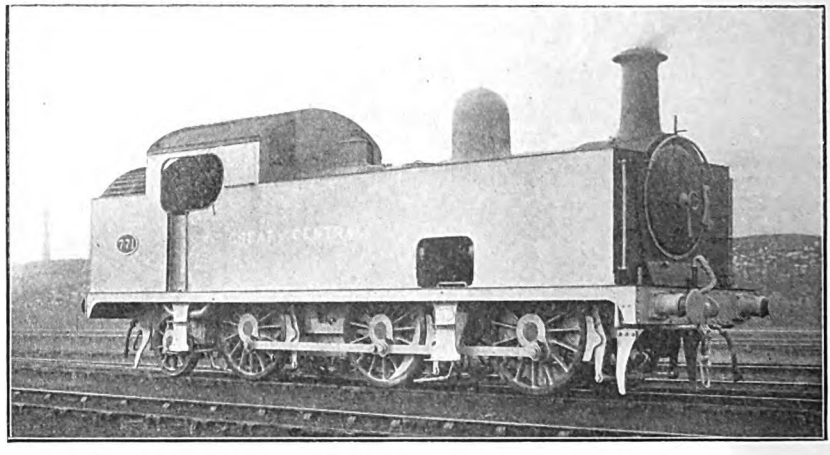
Rebuilt 0-6-2 Superheater Tank Engine: Great Central Railway.



BY the courtesy of Mr. J. G. Robinson, Chief Mechanical Engineer, Great Central Railway, we are able to illustrate a 0–6–2 tank engine as recently converted at Gorton. The engine was originally built in the 'nineties from the designs of Mr. Thomas Parker, then Locomotive Superintendent.

As rebuilt, a superheater is added and at the same time the water and coal capacities have been considerably increased. The engine still has balanced slide valves operated by means of Stephenson link motion. The original radial axle-box has been converted into a two-wheeled truck by the removal of the curved guides and the substitution of a radial arm, and at the same time the cross travel of the trailing truck has been increased so as to enable the engine to pass sharper curves.

New and original dimensions are as follows :—

	Rebuilt.	Original.
Cylinders	18 in. × 26 in.	18 in. × 26 in.
Coupled wheels—		
Diameter.. ..	5 ft. 1 in.	5 ft. 1 in.
Trailing wheels—		
Diameter.. ..	3 ft. 6 in.	3 ft. 6 in.
Carried on ..	Pony truck	Radial Axle-box
No. of small tubes ..	102	190
,, large ,, ..	15	—
Diameter of small tubes outside ..	$1\frac{7}{8}$ in.	$1\frac{3}{4}$ in.
Diameter of large tubes outside ..	$5\frac{1}{4}$ in.	—
Superheater—		
Type	Robinson	—
No. of elements ..	15	—
Outside and inside dia. of elements	$1\frac{3}{8}$ in. & $1\frac{1}{16}$ in.	—

	Rebuilt.	Original.
Heating surface—		
Small tubes ..	554 sq. ft.	963 sq. ft.
Large tubes ..	227 ,,	—
Firebox	99 ,,	99 sq. ft.
Total evaporating	880 ,,	1,062 ,,
Superheater inside	113 ,,	—
Total	993 ,,	1,062 sq. ft.
Grate area ..	18·4 sq. ft.	18·4 ,,
Working pressure— lbs. per sq. in. ..	160	160
Tank capacity— Gallons	2,000	1,360
Bunker capacity— Cubic feet ..	184	120
Weight in working order—	T. C.	T. C.
On coupled wheels	54 5	48 17
On Radial wheels	11 15	13 15
Total	66 0	60 12

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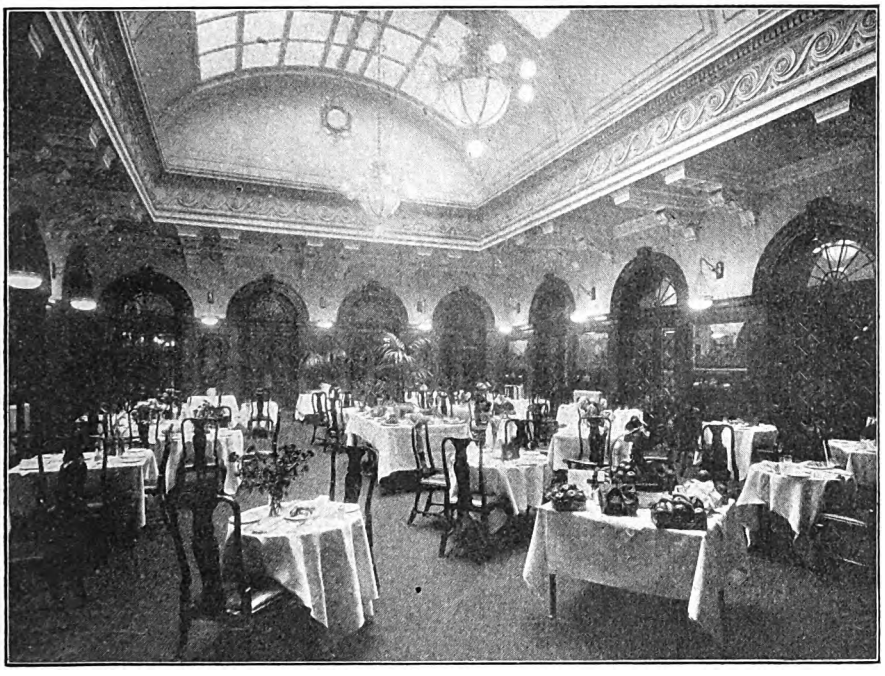
New Dining Accommodation at Euston Station, London and North Western Railway.



GENERAL VIEW IN THE DINING ROOM.

IN connection with the structural improvements in progress at Euston, and particularly adjacent to the "Great Hall," a new dining room and smoking lounge have been completed and brought into use. A view of the former is reproduced. It is 55 ft. long and 37 ft. wide, and has two entrances, one from the Great Hall and one from Platform No. 9. Architecturally the room is treated in the Renaissance manner, the walls being oak panelled to a height of 10 ft., with pictures illustrating early scenes in the history of the railway inserted in the panelling. Along all the sides of the room the wall surfaces are broken by a series of arched recesses treated in oak with pilasters and archivolt mouldings and keys.

Above the panelling there is a flat tinted frieze with ornamental plaster brackets, projecting under a flat ceiling 6 ft. wide, which runs round the room. Over the centre portion of the room there is a large barrel vaulted lantern, with enriched frieze and cornices round the lower portion, panelled plaster ends, and glazed top. The whole lantern is finished white. The electric light fittings were specially designed as a part of the architectural treatment of the room. A doorway from the dining room gives access to the smoking room, which also has an entrance from the Great Hall. The smoking room has the walls oak panelled to a height of 10 ft., with white friezes above, and an enriched plaster ceiling. The floor of this room is of rubber tiles. A feature of the smoking room is its recessed fire-place with dog-grate and wide upholstered seats. The rooms are ventilated mechanically, the fresh air being brought in, and the vitiated air extracted, by electrically driven fans. The temperature of the incoming air can be regulated, and the rooms are further heated by means of radiators. The new kitchens and serving room connected with the dining room are fitted up with a complete installation of electrical cooking apparatus.

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Railway Accessories.

Temperature Measurements on Modern Locomotives.

THE use of superheated steam on locomotives, whilst greatly increasing the efficiency and economy of the engine, has introduced to the engineer problems of control that were hitherto not present. The greatest is lubrication. If the steam temperature is not controlled trouble will quickly arise. Another is the ease with which the superheater can be damaged by excessive heat.

For these reasons modern locomotives are nearly always now fitted with an indicator in the cab, from which the engine-driver can read at any moment the temperature of the steam entering the cylinders. These instruments, generally known as pyrometers, can be operated electrically or mechanically. Pyrometers of the former class are largely used on British railways because they can be arranged for extreme temperatures if desired, and are easily disconnected; but mechanical pyrometers have the advantage of a more open scale. In this article we are illustrating both of the above patterns, as constructed by the Cambridge Scientific Instrument Co., Ltd., Cambridge, who, as is well known, specialise in work of this kind and have carried out many installations on land and sea for obtaining accurate temperature determinations.

Fig. 1 shows the electrical locomotive pyrometer complete. The indicator has a 4½ in. scale (see Fig. 2) which may be calibrated in Centigrade or Fahrenheit. This indicator is very robust, but at the same time quick-acting. The thermo-couple consists of two different metals joined together at one end, each wire being about 30 ft. in length. The hot junction or portion that receives the temperature to be measured is protected by a steel tube, but the special design adopted permits great rapidity of action without loss of strength. The remaining part of the couple wire is insulated and encased in flexible steel sheathing and fixed in position at the indicator by a screwed coupling. The motive force is derived from the effects of heat at the junction of the two metals, and no battery accumulator or other accessories are required. In the pyrometer described there are no screws or small parts—a consideration with any apparatus subjected to the vibration encountered on a steam locomotive.

Fig. 3 illustrates the mechanical locomotive pyrometer. In this case the motive agent is mercury under pressure, which acts on a Bourdon gauge with pointer. With this instrument the mercury, which is initially under pressure in a steel tube, expands with heating, thus increasing the pressure in the system. This increase in pressure is shown by means of a Bourdon gauge over a scale of 6 in. diameter, engraved in degrees of temperature. A screwed connection is arranged for fixing direct into the superheater header. This type of pyrometer is used largely, but the tendency, owing to the increasing temperature at which superheaters are now being worked, is in favour of the electrical type and

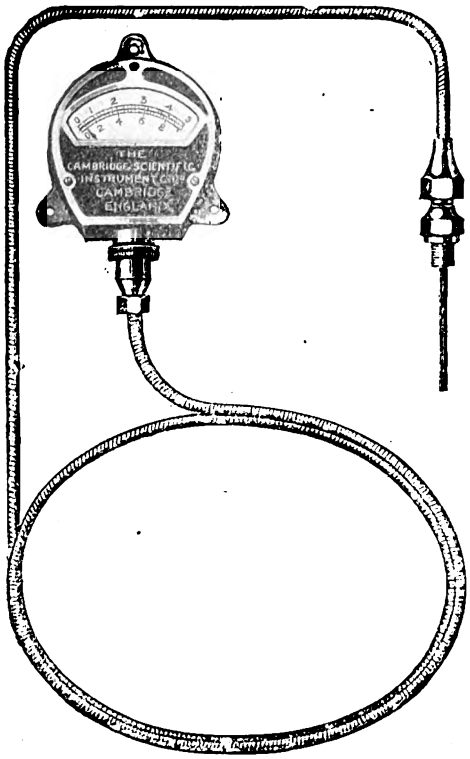

FIG. 1.

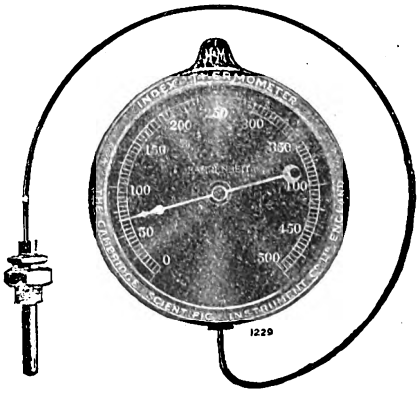

FIG. 3.

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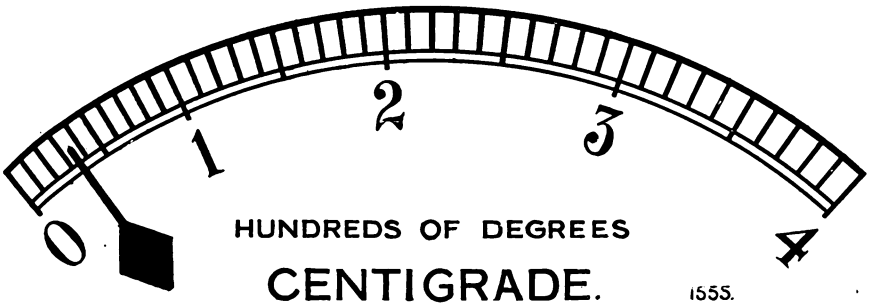

FIG. 2.

there is good reason for anticipating that in time this pattern will be almost universally employed.

"Stocal" Enamelled Tiles.

THE use of glazed tiles is now general for passages in and about underground railway stations; indeed, their employment is characteristic of nearly all "tube" stations as well as of many of the ordinary underground stations as have been remodelled or rebuilt during recent years, and in addition there are numerous subways similarly lined. This practice is generally appreciated, as the walls can easily be kept clean and if looked after do not become discoloured, while they give an impression of lightness and enable effective schemes of decoration to be carried out where the use of coloured tiles arranged to form patterns is favoured, as at many tube stations. For staircase walls, corridors, lavatories, and in many other applications the practice of using these tiles is now becoming general.

As a rule, however, these tiles are formed of earthenware, glazed and enamelled by usual methods, but Messrs. Mead, McLean & Co., Ltd., of 1A, Cockspur Street, Charing Cross, S.W., as agents for the "Stocal" Enamelled Tile & Iron Co., Ltd., of Burton-on-Trent, are now introducing "Stocal" and "Griff-Stocal" enamelled steel tiles for similar applications, giving equally effective results, but lighter and cheaper and possessing several important advantages.

The special enamels used for these tiles are manufactured *without the use of lead glaze*, and are impervious to all climatic and weather conditions, besides being fire-resisting and damp-proof. These enamels possess the advantage that they can be applied to numerous metal objects which hitherto have not been successfully enamelled, being free from the tendency to scale or break away from the metal surface as so often occurs after a time with advertising signs, tiles and other articles wherein metal is coated in this way.

Tiles of this class can readily be fixed to woodwork without defacing their own surfaces, and can advantageously be thus employed in countries where climatic and natural difficulties are serious. They can be decorated in colours and shading, often to an elaborate degree, so that their scope is a very wide one. When treated with "Stocal" enamels many articles, such as reflectors for railway carriage lights, can be effectively produced in this manner, and one testimony to their value is that many articles thus treated are in use by railway companies at home and abroad and for a variety of purposes. Used for wall decoration they can be seen at several underground stations, of which the new booking hall at Mansion House and the remodelled Charing Cross stations, Metropolitan District Railway, and the King's Cross and Paddington subways, may be mentioned as examples. In these locations the result is very satisfactory, and there is no indication that these are not the usual glazed tiles.

It is worthy of note that these tiles are enamelled all over, back and front, and not merely on the exposed surfaces, so that the metal is effectively protected. Every one is exact to shape and size, and the enamel does not crack or "craze" under any variation of temperature; neither does it fade or discolour. They are about one-third the weight of earthenware tiles, less bulky, and not liable to breakage. The "Griff-Stocal" tiles differ only in that the turned back edges are adapted to take concealed screws for attachment to woodwork, and are at the same time flanged to interlock together.

Complete lamp bases and reflectors for carriage lamps are now made by "Stocal" methods, the special enamel enabling any desired decorative methods to be realised. Similarly, door handles, may be made in the same way, also metal fittings of many kinds, the iron being enamelled either to imitate brass or to harmonise with cabinet work. When these methods are adopted, cleaning is a very simple operation, and there is no need for usual brass polishing operations, while cheapness is a further, and often a most important advantage.

Attention may also be directed to certain other details supplied by Messrs. Mead, McLean & Co. For example, a neat pattern of carriage door ventilator. It is merely fixed outside over an opening above the window but gives a very efficient but unnoticeable means for extracting used air as a train proceeds. It applies for both directions, and is operative under all wind conditions, but has no moving parts, construction being very simple. A new pattern of door window mechanism is also being

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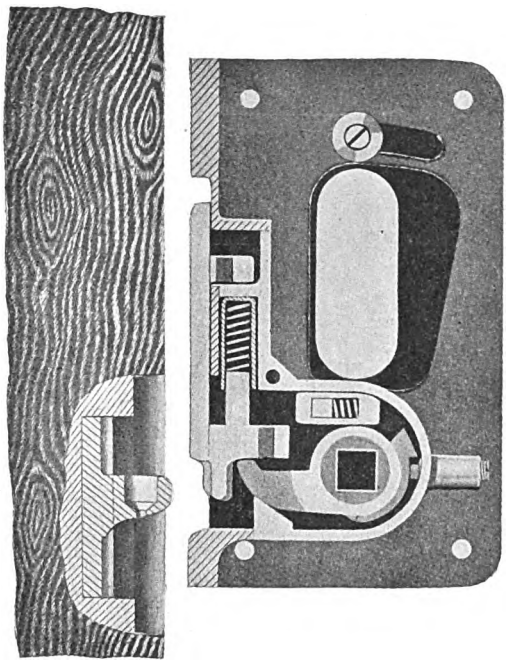


MECHANISM OF "M.M." SLIDING DOOR LOCKS FOR CARRIAGE EQUIPMENT.

introduced. The window can be retained in any desired position, when balanced the exertion required to raise it is very slight, and an efficient engagement with the fence-rail is ensured.

Sliding Door Locks.

MESSRS. MEAD, MCLEAN & CO., LTD., also manufacture many details suitable for railway and general use, and included is the Patent "M.M." sliding door lock. This is designed to meet the needs of the extending practice of using sliding doors for railway carriages, exterior on electric car stock, and also for luggage vans and the like, and interior for separating compartments from side corridors.

A main principle influencing its design was to produce a door lock differing essentially from those used for hinged doors, so as to avoid passengers mistaking the class of door and either experiencing difficulty in manipulating it or mistaking it so as to incur danger to themselves; the latter factor applying mainly to exterior doors. The use of projecting portions is entirely dispensed with, the locks being flush with the doors. Incidentally, this gives the maximum amount of room.

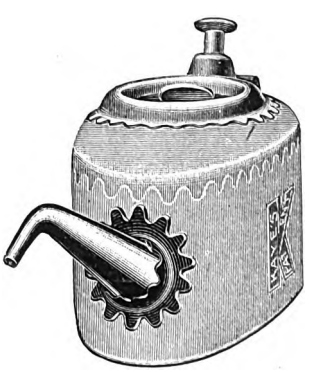
These locks are simply constructed, with finger pieces, reached through openings in the lock fitting, of a radially moving type operating the locking portion by a simple, inexpensive and reliable mechanism. A private lock can be added for use by train officials, this operating directly upon a spindle of the locking mechanism.

"Kaye" Locks and Oil Cans.

MENTION of door locks direct attention to the wide vogue which the well-known "double-catch" or "safety" locks supplied by Messrs. Joseph Kaye & Sons, Ltd., of Leeds, have obtained. These locks are now employed for suburban trains on many railways, and tens of thousands are in use, and have added very materially to the safety of railway travelling, owing to the fact that the two-stage action has so often prevented outer doors being dangerously opened in error, or irresponsibly by children. To the long list of railways using these locks must now be added the London, Brighton and South Coast, for whom an extensive order for Messrs. Kaye's patent wedge locks is now being fulfilled. Messrs. Kaye also supply many other patterns of locks, several of which are specially designed to meet the conditions applying to railway carriage exterior or interior doors.

Messrs. Joseph Kaye & Sons, Ltd., are, however, almost as well known at this date on account of their patent serrated seamless oil-cans, and the following railways using them may be mentioned as showing their wide vogue and acceptance: Great Western, London and North Western, Lancashire and Yorkshire, London and South Western, Hull and Barnsley, Midland Great Western Railway of Ireland, Central Argentine, Buenos Ayres and Pacific, South African, etc., etc.

An illustration is reproduced showing the latest design of these oil-cans. The spout is secured to the body of the can by the formation of a seamless serrated boss having a serrated flange. This arrangement, like the top of the can, allows for an increased soldering surface, and the part is now so strongly attached that it is claimed that it cannot be broken off by ordinary means. The other improvement is at the back, where the handle, formed out of a piece of 15-B.G. steel, is fastened to the body by four rivets, a plan which dispenses with the soldering method formerly employed. Hitherto the tin handle has



SEAMLESS SERRATED OIL CAN.
Messrs. Joseph Kaye & Sons, Ltd.

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PERTINENT PARAGRAPHS

The New Year's Honours.

In these royal recognitions of valuable national service it is rarely that railway associations are entirely omitted, and on this occasion His Majesty has conferred honours upon quite a number of gentlemen whose names are familiar in railway circles. In noting the appointment of His Grace the Duke of Devonshire, G.C.V.O., to be a Knight of the Order of the Garter one may direct attention to the long association of the Dukes of Devonshire with the Furness Railway, of which the Chairmanship has even now only been relinquished in view of the present duke's appointment to an important Government position.

Of the new barons, two are conferred upon gentlemen whose names are now household words in railway circles. Sir Alexander Henderson, Bart., M.P., has for several years directed the fortunes of the Great Central Railway as Chairman of the Board of Directors. He has taken a leading position in connection with many railway events, and is recognised as one of the most capable of our railway chairmen. It is understood that he will take the title of Lord Farringdon.

Sir Thomas George Shaughnessy, K.C.V.O., is president of the Canadian Pacific Railway. He was born in 1853, at Milwaukee, where he received his education at the common schools. He began his railway career at the age of 16, when he entered the service of the Chicago, Milwaukee, and St. Paul line, and rising step by step, became assistant general manager, and then vice-president and director of that company. It was in 1891 that he transferred to the service of the Canadian Pacific Railway, and eight years later became the president (or as we should say, chairman) of that great system. He is also president or director of a number of other railways, all of which are directly or indirectly connected with the Canadian Pacific Railway. In 1901 he received the honour of knighthood from Queen Victoria, and he was created K.C.V.O. in 1907.

Mr. D. A. Thomas, who becomes Baron Rhondda of Llanwern, is a director of the Taff Vale and Port Talbot Railways. Added to the lists of the Privy Council are Sir Frederick George Banbury, Bart., M.P., a Director of the Great Northern Railway; while a Baronetage is conferred upon Mr. S. E. Palmer, Deputy-Chairman of the Great Western Railway Company. The honour of Knight Bachelor conferred on Mr. William Wilson Hoy, General Manager of Railways and Harbours, Union of South Africa, will give great satisfaction in the Union and to his many friends at home. From the operative point of view, however, the most popular honour is that conferred by His Majesty upon Mr. Francis Henry Dent, and the career of Sir Francis is dealt with in another portion of this magazine under the caption of "The Railway Portrait Gallery."

Railway Publications and the War.

With the January number the price of "Bradshaw," probably the best known railway time-table compilation in the world, is raised from sixpence to a shilling; and this fact directs attention to the difficulties now experienced by publishers due to the increased costs of materials and the new postal rates. In the case of "Bradshaw," with its 1160 pages, the cost of the paper is probably a sufficient reason for the increase of price. Publishers using paper of good quality and having a considerable circulation for their publications, know how acute is the paper situation, for not only are prices seriously higher than they were, but there are difficulties in obtaining desired qualities as and when required; and with a time-table book such as "Bradshaw," where close printing and crowded pages demand paper of special quality, the question must be a serious one. How important this matter is is shown by a recent issue of Bradshaw's Guide, of which the whole, or possibly a part only, was printed on a commoner and thicker paper, with the result that this particular number became most unwieldy and entirely devoid of the compactness which has been associated with this work for so many years.

Curiosities of War-Time Train Working.

Commenting upon paragraphs included in our last issue, Mr. A. S. Williams writes as follows:—"I notice that in your January magazine a correspondent remarks that quite recently he saw the second part of the 2 p.m. *ex*-Euston hauled by two 'Jumbos,' but regrets that he did not obtain their numbers and names. If this was on November 19th, the engines in question were 857 *Prince Leopold* train engine, and 1521 *Gladstone* pilot, and I think the load was = 19½, but I cannot say for certain. I also read that a London and North Western goods engine was seen piloting a South Eastern and Chatham 4–4–0 engine on a Red Cross train at Gospel Oak, but that same morning 4000 *North Star*, a Great Western 4–6–0, passed there, to test the

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platforms on that line, which have been raised lately. On a recent Sunday practically the same thing as Mr. Wallace mentions happened again, when No. 750, a South Eastern and Chatham 4-4-0 piloted by 1235, a London and North Western 0-6-0, passed, on a London and North Western Red Cross train, and about an hour after No. 771, a Great Eastern 2-4-0, came down with a train-load of horse boxes, etc. For a line that has taken foreign engines since the war started, I think the Hampstead Junction line requires some beating. I have seen London and South Western, Great Northern, Great Eastern, London and North Western, London, Brighton and South Coast, South Eastern and Chatham, and Midland (London, Tilbury and Southend) engines on various occasions."

Another reader, Mr. M. Grouse, writes on the same subject as follows :—" On the Hampstead Junction line at Gospel Oak, used by London and North Western and North London trains, I have seen since the outbreak of war no fewer than 530 " foreign " engines, belonging to the following companies: London and South Western, Midland (London, Tilbury and Southend), Great Eastern, Great Northern, South Eastern and Chatham, London, Brighton and South Coast and Great Western Railways. Another interesting item I might mention is that whereas previous to the war, nothing larger than a North Western 'Cauliflower' worked on this line, now almost every day may be seen Great Northern 521 Class superheater goods, Great Western 4-6-0's, Great Eastern T19's, while recently I noticed a Brighton 'Atlantic' No. 426, hauling an empty Great Eastern troop special."

Locomotive and Train Working in the Latter Part of the 19th Century.

Mr. Ahrons writes pointing out that the illustrations of Great Western Railway broad gauge engines Nos. 2051, 2093 and 2151, reproduced last month, are from photographs by the Locomotive Publishing Co., Ltd.

Commenting upon remarks made by Mr. Ahrons in the course of his articles dealing with the broad gauge locomotives of the Great Western Railway. Mr. W. H. Robson, of Cardiff, writes as follows :—" . . . . the speed records of the 8-foot single-wheelers, stationed at London, appear to have been very ordinary, and the results clearly indicate that 'keeping time' was a secondary consideration, 'coal-saving' being the first one. The poor speed of 66½ miles per hour down Wootton Bassett bank reminds me that I once heard my father, who was a Bristol driver on the Great Western expresses during the period when the records mentioned were taken, say that on one occasion when he backed his engine on to the down 'Zulu' at Swindon, to assist* the London engine to Bristol the engineman actually requested him not to run too hard down Wootton Bassett bank and Box Tunnel. The London engineman, who was a regular broad gauge express driver, was nicknamed 'Katie,' and he deserved it.

" I happen to be well acquainted with the express engines of the Great Western Railway during the 'eighties, more especially those stationed at Bristol, as I was serving my apprenticeship to engine-fitting, at the old Bristol and Exeter shops, from 1884 to 1888, finishing up at the Swindon shops in 1890. 'Coal-dodging' was a 'failing' of most of the express drivers stationed at Bristol, although it was always possible to get a free 10 cwts. of coal at the Bristol coal-stage for 6d., so if an engineman wanted to do a bit of 'running' this was the penalty, or to be disgraced by having his name on the list of enginemen headed 'men required in this office,' which was posted up outside the foreman's office every fortnight when the consumption sheet came out. The coal consumption of the broad gauge single-wheelers varied from about 24 to 28 lbs. per mile, the same men always occupying certain relative positions on the consumption sheet. . . . "

Broad Gauge Single-Wheelers at Newton Abbot.

Mr. Robson continues :—". . . . I may state there were three or four broad gauge single-wheelers stationed at Newton Abbot from 1887 to 1892. The *Warlock* was one of them. This change took place when the 'Jubilee' was put on. The number of the engine that ran off the road at Long Ashton, in 1876, was not number 2004, but 2001. This engine, and No. 2005, were the first two Bristol and Exeter engines to be overhauled by the Great Western Railway at Swindon. They both came down to Bristol from Swindon together. Wm. Dunscombe, who, together with his fireman, was killed in the accident, had 2001, and my father 2005. No. 2001 had only been down from Swindon a few days when she came to grief. The condition of the permanent way was blamed for the accident, but Mr. Dunscombe, on the day before the accident, remarked to my father that his engine was 'riding very peculiarly, and that she would either have him up in the hedge or down in the ditch.' There is no doubt but what there was something unusual in the behaviour of the engine, as the driver was an old Bristol and Exeter man, so knew the engines well. It was thought, at Bristol, that the axle-boxes had been fitted too tightly in the 'horns' of the bogies when overhauled at Swindon. In fact, years after when I was apprenticed, the practice at the old Bristol and Exeter shops was different from that at the Swindon shops, the axle-boxes when fitted being left 'freer' in the horns at the former shops, than at Swindon. At the accident the engine broke away from both bogies, the trailing one having landed right into the guard's van. A further nasty accident was prevented by the guard, who ran towards Bristol and stopped the 12.10 p.m. down express just before it reached the scene of the accident. No. 2001 was lying right across the 'down' road."

* Mr. Ahrons explains that the engine would be returning home. No "assistance" would be required over this part of the road.

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"I may add there was another engine of the same type as No. 2005; she was No. 2006. They were both stationed at Bristol. I do not remember the end of No. 2006, but, in 1884, the boiler of No. 2005 was used for driving the stationary engine in the turning shop at Bristol, whilst the stationary boilers were being replaced. In about 1885 to 1886 No. 2005 was taken to Swindon and scrapped."

High Speed down the Wellington Incline.

Mr. Robson also mentions some sensational speeds down the Wellington incline, but as no account is made of seconds, they can hardly be accepted as evidence. Mr. Ahrons remarks that he does not think these engines ever, for instance, went down 11 miles in 8½ min., which is 78 miles per hour from the tunnel to a dead stop at Taunton. The *Lightning* ran from Whiteball siding to Taunton when he was on it in 9 min. 18 sec., and was being pushed for all she was worth, and ran 4 miles at 80–81 miles per hour. He also joins issue with Mr. Robson as to engine No. 2001. He writes that No. 2004 and not 2001 was the engine in the Bourton accident, and it was then broken up and not converted like 2001–2 and 3 to tender engines. Mr. Dunscombe was, however, the driver killed. As to "singles" stationed at Newton Abbot, the change must have been made some time after 1887, and the opinion is expressed that Mr. Robson is wrong as to dates, but possibly right as to facts. Mr. Ahrons estimates 1890 as the more likely date when the "Cornishman" was put on. But when he was firing in 1887–8 there were no singles at Newton Abbot. He further remarks that No. 2006 was similar to No. 2005, but was scrapped very early in the 'eighties, while No. 2005 lasted until 1887 or 1888.

"Singles" on the G.W.R. Western lines.

Mr. F. A. Brander writes as follows:—"In the current issue there is a reference to the '8 ft.' singles and the South Devon inclines. I resided from 1900-1905 at Newton Abbot, then a great 'Single' shed, and followed the workings with great interest, having many good runs up the line with such capable drivers as Westcott, Lucas, Harry and others. I remember in 1905 the down 'Cornishman' leaving Exeter about 2.30 p.m. and booked non-stop to Plymouth, North Road, due about 3.45 p.m., used to load up very heavily and frequently stopped at Newton Abbot for a pilot to Rattery or Brent, invariably a 4–4–0. Sometimes it was double-headed throughout, and in that case often one of the Exeter 7 ft. 8½ in. singles assisted the 4–4–0, generally *White Horse* or *St. George*, the single returning as pilot on the 8.20 p.m. *ex*-North Road, night mail, passenger portion, having gone right through to Plymouth and having to tackle 'Hemerdon' on the return. I several times came up with it. I also remember on two distinct occasions when the 'Cornishman' was divided at Exeter, the second portion consisting of five of the old 'eights' being sent through in charge of *White Horse*. On each occasion I saw the train pass Newton Abbot and much regretted not being in it."

In reply Mr. Ahrons writes:—"It is interesting to learn from Mr. Brander's letter that 'single' engines were at one time used between Newton Abbot and Plymouth, although the period referred to by him relates to the subsequent 'narrow-gauge' working. I may observe, however, that my remarks on the working of 'singles' over this section referred specially to the *Iron Duke* class of the broad gauge, which were much less powerful engines than the later 7 ft. 8 in. singles mentioned by Mr. Brander."

Train Service Reductions and Alterations.

With the New Year several railways made somewhat extensive reductions and alterations in their train services, but although in certain instances they appear of a drastic character this is not altogether so when the facts are analysed.

Important alterations are being made, it is true, and we regret in particular the disappearance of the famous two-hour schedules between London and Birmingham; but, on the whole, the situation is not seriously affected. Where trains are withdrawn altogether, it is usually found that alternative means of conveyance are available, or conditions have so changed that certain services are now unnecessary, as, for example, in the late evening hours when there is relatively little ordinary travelling, so that the late evening "fasts" on suburban routes are not justified. In other instances there is a degree of retrogression, sometimes due to the making of additional stops, in others with the object of sparing the engines in view of the difficulties of maintenance and the exceptional loads now usual with particular trains. Speaking generally, however, there is a commendable regard to the travelling requirements of the general public, and there are few cases where reductions and alterations impose serious inconvenience.

London and North Western Railway Train Alterations.

New time-tables issued to apply from January 1st include a few items of interest. The 9.20 a.m. Birmingham express now leaves at 9.15 a.m. and calls at Blisworth instead of slipping, so as to give connection from Northampton as well as for that town. The 11.50 a.m., 2.30, 4.45, and 6.55 p.m. two-hour Birmingham expresses are now given 10 min. longer, starting respectively at 11.40 a.m., 2.25, 4.35, and 6.50 p.m. In the case of the 4.35, and 6.50 p.m. trains stops are now made at Coventry instead of slipping there (to set down only). The old 1.15 p.m., now 1.20 p.m., calls further at Rugby (to set down), and is allowed 2 hours 15 min. to New Street. The 5.20 p.m. down Sunday express is similarly allowed 2 hours 10 min., while the altered week-day up trains at 8.40, 11.20 a.m., 2.45, 4.50, and 6.20 p.m., and at 11.35 a.m. and 6.25 p.m. on Sundays, are

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also given this time, with stops (to pick up) at Coventry in the case of the 8.40 a.m. and 6.20 p.m. Birchills and Landywood stations will be closed, and trains will cease to call there. Heaton Chapel station, situated between Manchester (London Road) and Stockport, will in future be known as "Heaton Chapel and Heaton Moor." The service of passenger trains on the Princes End branch is suspended, and the stations at Ocker Hill and Princes End closed. A number of suburban and less important trains are also withdrawn, and others altered, in some instances to compensate therefor.

Great Western Railway Alterations in Train Services.

EXPRESS services to and from the West of England, South Wales, and West Midlands are being maintained without material alterations, but the London and Bristol service is reduced by one train in each direction, the 1.10 p.m. from Paddington to Bristol (only between London and Swindon), and the 9.10 a.m. from Bristol to Paddington, except on Mondays. As regards the latter, there is already a following express at 9.35 a.m., so that the withdrawal is not very serious.

The London and Weymouth service loses the 10.25 a.m. train from Weymouth to London. The London, Birmingham and North service, the 8.5 p.m. down train from Paddington, and the 8.0 p.m. up train from Birmingham; whilst, in this instance, the remaining services are slightly decelerated—the down trains at 11.5 a.m., 2.35 p.m., and 6.5 p.m., from Paddington being, in each case, five minutes earlier, and the trains from the North and Birmingham arrive about ten minutes later. The 9.10 a.m. from Paddington stops at Leamington instead of slipping, and also takes the new timing of 2 hours 10 min.

The Great Western trains between Birmingham and Dudley, *viâ* Great Bridge, have been withdrawn. There are also suspensions and alterations of trains in the following local and branch services: The London Suburban, Bristol Suburban, Slough and Windsor, Didcot and Newbury, Oxford and Fairford, Watlington and Princes Risborough, Maiden Newton and Bridport, Plymouth, Tavistock and Launceston, Bodmin, Truro and Camborne, Gloucester and Hereford, Oldhill and Halesowen, Ruabon, Dolgelley, Bala and Blaenau Festiniog. A number of stations have been closed to passenger traffic on week-days and Sundays.

Train Alterations on the North British Railway.

BETWEEN Edinburgh and Glasgow the following trains have been withdrawn:—From Waverley: 6.10 a.m., 9.35 a.m., 5 p.m., and 10.10 p.m. (Saturdays only). From Queen Street: 11 a.m. (except Saturdays), 2.20 p.m. (Saturdays only), 8.20 p.m. and 10.30 p.m. (Saturdays only). There is, however, a good service of trains still remaining, and as tickets are inter-available with the Caledonian route, travellers between the two chief cities of Scotland will not be seriously incommoded, while the withdrawal of the two late Saturday trains is presumably justified, for intermediate stations served, by reduced travelling at such times.

"Brighton" Alterations.

ON the London, Brighton and South Coast Railway a fair number of train alterations have been made, but in conjunction with combinations of trains, new connections, rearrangements, etc., the general standard of the services is well maintained; the majority of the reductions are in services which have become more or less superfluous or for which compensation can be given. On the Portsmouth road the principal losses are the 8.55 a.m. down from Victoria and the 4.45 p.m. up train. In regard to Eastbourne and Hastings the 10 a.m., 4.30 and 7.45 p.m. trains from Victoria and the 5.56 p.m. down, except on Saturdays, from London Bridge to Eastbourne; the 8.15 a.m. Hastings to London Bridge; 11.45 a.m., 4.20 p.m. and 9.30 p.m. from Eastbourne to Victoria; and the 4.58 p.m. Bexhill to Victoria disappears as such, but there are several compensating rearrangements. On the Brighton road the 11.40 a.m. from Victoria becomes a connection to East Croydon with the 11.50 a.m. from London Bridge, the 4.30 p.m. becomes a Brighton train, the 5.56 p.m. (not Saturdays) from London Bridge disappears also as a West Worthing train, the 9.32 a.m. up from West Worthing is cancelled, and there are several reductions in local services as between Hayward's Heath and Brighton. On the other hand several Brighton trains now combine Eastbourne and Hastings portions in place of trains removed, so that the general standard of the facilities provided is not seriously lowered. Modifications in local, suburban and rail motor car services are also included.

The Railways of Berkshire.

Too late for inclusion in Mr. Alderman's article under this title in our last issue, further particulars came to hand to which brief reference may now be made. The Great Western Railway main line just outside Twyford crosses both the rivers Slade and Loddon and not the Loddon only. Remarks as to goods train diversion at Reading require to be modified to agree with the statement that all goods traffic is diverted at the Reading Main East Signal Box or Scours Lane junction Signal Box to the goods lines, which run to the marshalling sidings at Reading West junction. The main line West Box has 210 levers, not 208 as stated. Automatic electric signals are installed between Tilehurst and Pangbourne as well as between Pangbourne and Goring as stated. At Didcot the junctions at the north end only are included in the Siemens electric signalling installation. In regard to the old Berks and Hants line proper, this commences at 37 miles 68 chains (Southcote junction). From Reading Station (36 miles) to 37 miles 68 chains is part of the old Basingstoke

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Branch. Stratfield Saye should be Strathfieldsaye. At Newbury there is also a bay at the east end of the up platform, in addition to those at the west end as mentioned. We may also direct attention to the fact that the corn market at Newbury rivals, if it does not exceed, that at Reading in importance. The Didcot, Newbury and Southampton Railway leaves the Great Western Railway for the south just over a mile from Newbury at Enborne Junction, while the northern section joins about half a mile east of Newbury. The Bristol division of the Great Western Railway commences 2½ miles west of Foxhall Junction, Didcot. It may be pointed out, also, that the quickest times between London and Berkshire towns noted are those which apply under normal conditions.

Recent Railway Accidents.

About 5.30 p.m. on the evening of Wednesday, December 15th, a collision occurred at New Cross Station, South Eastern and Chatham Railway. The official statement is that the 5.17 p.m. from Charing Cross to Gillingham ran into the rear of the 5.20 p.m. train from Cannon Street to Dartford, which was standing in New Cross Station.

A terrible railway disaster occurred on Friday, December 17th, on the North Eastern Railway, at St. Bede's Junction, between South Shields and Newcastle. A statement on behalf of the Company was made by Mr. J. B. Harper, assistant general superintendent, on his return to York. In the course of it he said: "A heavy goods train was coming up from Tyne Dock, assisted by an engine in the rear. In the ordinary course of working, this engine leaves the train at St. Bede's Junction, where the Tyne Dock line joins the passenger line that runs from South Shields to Newcastle. The pilot engine waited on the opposite main line to go back to the docks, and stood for some time, when the 7.2 passenger train from South Shields to Newcastle was signalled and accepted by the signalman at St. Bede's Junction, who pulled off his signals, and the passenger train ran into the light engine. The derailment threw the leading coaches of the South Shields train over to the down line just at the moment that an empty passenger train that had been conveying workmen to Hebburn was returning to Tyne Dock, and this train ran into the débris. The train immediately took fire, and before the passengers could be got out the flames were so fierce that they were burnt to death if they had not been killed before." Since this report was issued the death roll has been stated as seventeen.

At an adjourned inquiry, Mr. A. C. Stamer, acting Chief Mechanical Engineer, North Eastern Railway, in reply to the Board of Trade Inspector, Col. von Donop, said the gas cylinders on trains were not fitted with safety valves. The Company had experimented with two different types to prevent the rush of gas out of the cylinders, but had found both unreliable. They were still experimenting to find a satisfactory valve. As precautions against fire they had fitted 770 vans with rescue and fire appliances during the past few years. To 924 vans they had also fixed lead pipes to feed the lamps. The object of this was that if there was a rupture of the pipe it could be readily closed by means of a hammer. In the case of the old steel pipes this could not be done. Mr. Stamer added that since incandescent gas burners were introduced it had been possible to reduce the number of cylinders under each vehicle. Steps had also been taken to strengthen the ends of leading vehicles to prevent them telescoping, but none of the carriages of the passenger train in this accident had been treated in this way.

Great Western 4-2-2 Engines.

A Bath reader writes:—"May I supplement Mr. E. Little's note on page 73 of your January issue by the following particulars? No. 3074 was originally named *Princess Helena*. No. 3050, *Royal Sovereign*, was one of the engines of this class to be fitted at one period in their career with a domeless parallel boiler of the well-known 'Camel' type. The precursor of this development was No. 3027, *Worcester*, which made her appearance thus rebuilt in August, 1900. At first the cast-iron chimney was adopted in these rebuilds, but No. 3050 has always carried a copper-capped chimney, but of varying height. In 1903 the domeless coned boiler made its appearance on the Great Western Railway with the advent of the 'City' class of 4-4-0 locomotives, but all the 4-2-2 rebuilds carried the parallel type of domeless boiler. As finally rebuilt, No. 3050 was illustrated on page 35 of Vol. XXXVI. of the Railway Magazine. To haul the funeral train of Queen Victoria from Paddington to Windsor on February 2nd, 1901, No. 3373 (since re-numbered 4120), the pioneer of the 'Atbara' class, the name of which she bears, was employed. For this journey she was specially re-named *Royal Sovereign*, and the name-plates of No. 3050 were temporarily fixed above her driving splashers. Two features of the last re-build, in addition to those detailed by Mr. Little, were the lengthening of the chimney to correspond with the height of the steam dome, and the provision of a smokebox of the same external diameter as the boiler. In the late Mr. William Dean's original design, a dwarfed chimney was provided, which gave these engines a very distinctive appearance, and the smoke-box was of slightly larger diameter than the boiler, and finished at its junction with a polished rim. The first intimation in the Company's magazine that these engines were being withdrawn from service appeared in August, 1908, when it was stated that No. 3001, *Amazon*, No. 3014, *Iron Duke*, and No. 3015, *Kennet* (the engine in the Slough accident, caused by its driver over-running the signals on June 16th, 1900) had been condemned. By a coincidence, the same year (1908) witnessed the arrival of the mammoth Pacific locomotive, *The Great Bear*. It is some satisfaction to know that although there is no indication at present that the last of these

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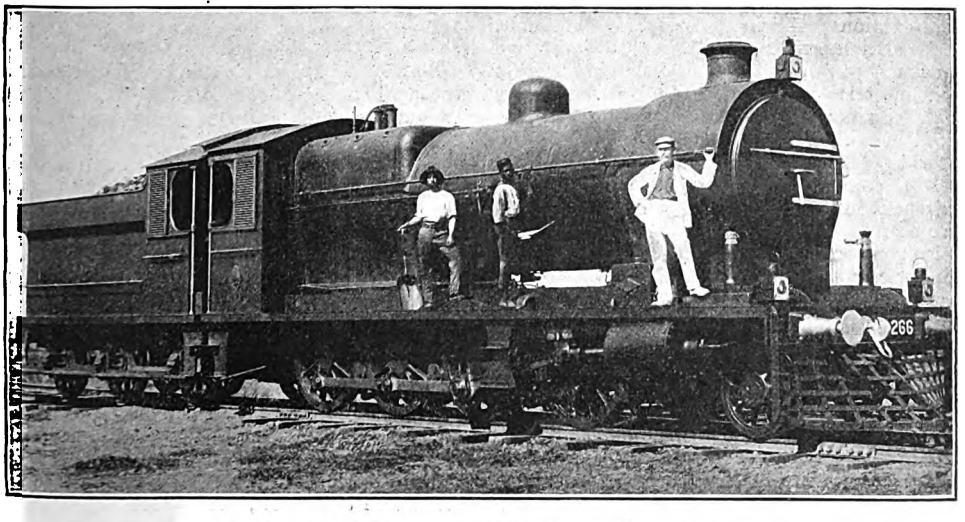
historic locomotives is to be preserved, a representation of one of the class in its original form appears in the Swindon Borough coat-of-arms."

Underground Electric Railways Company of London, Ltd.: Pooling Arrangement.

THE Directors of the Underground Electric Railways Company of London are completing arrangements for the pooling and division of surplus revenue between the City and South London Railway, the Central London Railway, the London Electric Railway, the Metropolitan District Railway, and the London General Omnibus Companies. This agreement, under the powers of the London Electric Railway Companies' Facilities Act, 1915, is conditional upon the sanction of a shareholders' meeting specially convened. Our contemporary *The Railway Gazette* ably summarises the reasons for this action by pointing out that the District Railway, being under Government control, had no difficulty with regard to the payment of the war bonus to its men, but the tube companies, not being in that position, were unable, on account of smaller traffics and increased expenses, to meet the request of their men to be placed on an equality with their fellows on the District. This led to triangular negotiations between the companies, their men's representatives and the Board of Trade, which resulted in the passing of the Facilities Act, enabling the stronger members of the partnership by means of a common fund to help the weaker. Each company retains all moneys which it receives for traffic (including through fares) without apportionment, and pays the surplus, after payment of standing charges and due provision for depreciation and reserve, into a common fund, which is to be distributed in certain agreed proportions. In case of a deficit by any one company in meeting its standing charges it may recoup itself out of the common fund, and still be entitled to its prescribed share in that fund. The agreement has been the more easily arrived at because the omnibus company is feeling the effect of the withdrawal of many of its 'buses for Government purposes, whilst tube companies are benefiting to some extent from reduced omnibus competition. The agreement provides that the surplus earnings of each of the contracting companies, after the payment of standing charges and due provision for depreciation and reserve, shall be paid into a common fund which shall be distributed as follows:—

	Half-year	
	Down to December 31st, 1915. Per cent.	To June 30th, 1916, and following. Per cent.
City and South London ..	2	6
Central London	20	20
London Electric	26	30
Metropolitan District ..	12	12
London General Omnibus	40	32
	100	100

A special clause provides for the second preference stock of the District Company, which is at present excluded from the schedule referred to under "revenue liabilities," but may be included at any time after the expiration of one year from the date of the agreement on seven months' notice from the District Company. It is provided that each of the companies shall afford reasonable facilities in respect of passenger traffic to the public, and to each other in the way of through booking and convenience for the



2-8-0 LOCOMOTIVE: BENGAL STATE RAILWAYS.

We are indebted to Mr. A. M. Willox, Great North of Scotland Railway, for the photograph above reproduced, of which his uncle, Mr. A. Willox (standing alongside the smokebox) is driver.

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interchange of traffic. The arrangement is to be perpetual unless determined by agreement, and is to take effect as from January 1st, 1915.

Mr. Frank Tatlow: Assistant General Manager, Midland Railway.

WE congratulate Mr. Frank Tatlow, for many years principal assistant to the General Manager, Midland Railway, upon his appointment to the new position of Assistant General Manager, Midland Railway. Mr. Tatlow has been associated with the General Manager's Department from the time when he entered the Company's service as a boy. He has the distinction of having been personally connected with every General Manager the Midland Railway has had, Sir James Allport, Mr. John Noble, Mr. G. H. Turner, Mr. John Mathieson, and Sir Guy Granet.

Electrification of Suburban System: Victorian Railways.

PROGRESS of the electrification of the Suburban Railways has been retarded by the conditions created by the war, and it was not practicable to electrically operate the line between Sandringham and Essendon in December, 1915, as was originally contemplated. Erection of the main buildings, the switchgear and transformer house, and the offices and other structures at the Newport power house has been actively proceeded with, and considerable sections of the boiler-house equipment and portions of the condensing plant and of the first 10,000 k.w. turbo-alternator set have been installed. Several sections of the Jolimont car repair shed have been completed, and arrangements have been made for the installation of the electric overhead travelling cranes, machine tools, and other accessories required for the periodical overhaul of the rolling stock.

Sub-stations at Princes Bridge, Newmarket, Middle Brighton, Glenroy, and Newport are sufficiently advanced to admit of the installation of the electrical apparatus. High tension cables for the transmission of electric current are being placed in position as rapidly as the supplies of materials will admit, and the contractors have already commenced to instal the electrical equipment in the carriage stock. Arrangements have been made for the local manufacture of the latticed steel masts and the bridging and accessories for the overhead equipment of the permanent way. It is proposed to equip the line between Newmarket and the Flemington Racecourse as early as practicable, so that the staff may acquire the requisite skill and experience to enable them to operate the trains.

The electrification of the suburban lines will admit of the provision of an increased service during busy periods, by the adoption of a closer interval between trains, but in order to obviate difficulty in maintaining the more frequent service, it is proposed to introduce an automatic system of signalling, with various safe-working appliances. The system will provide for a closer spacing of signals and for the electric control of the line in such a manner as will prevent the exhibition of a clear signal when the section in advance is occupied, whilst the automatic stops will, if a signal be passed at danger, cause a suspension of the power and the application of the brakes, and the installation generally will not only increase the carrying capacity of the lines, but will also afford the maximum safety to the travelling public.

A Canadian Railway Working Timetable.

MR. ERIC CRICKMAY, one of our readers who left the "old country" some years ago and is now engaged in railway service in Canada, sends a copy of a Canadian Pacific Railway working timetable for the Alberta Division. He marks several items as likely to be of interest, and these and others may be referred to.

It is a somewhat unwieldy pamphlet 16 inches wide and 11 inches high, of 20 pages, but is presumably intended to be folded vertically in four sections after the fashion of the usual American folders, or else rolled up. The first sheet, constituting the cover, after the usual heading and the name of the division, is identified thus :—

TIME **17** TABLE

the numeral being in large characters and printed in green, so that the particular issue is at once apparent. Other information is that it takes effect "at 24.01 o'clock Sunday May 30th, 1915" and that it is "governed by mountain time" and is "for the government and information of employees only." It is further pointed out that "the superior direction is east or south, and east or southbound trains are superior to trains of the same class in the opposite (inferior) direction." After a notice as to the rule book, printed separately, the names of the Assistant General Manager and General Superintendent give authority to the publication.

Train Services and Special Instructions.

THE first page inside gives mileage details of the various sections, with the names of local superintendents, train masters at terminals, despatching offices and train despatchers; while the second column mentions the medical officers and their districts. Page 2 sets forth the train services on the Medicine Hat sub-division, station names in the centre, westbound trains to the left reading downwards, and eastbound trains to the right reading upwards. The list of stations gives intermediate mileage on the decimal system—6·3, 4·9, 5·7, etc.—with notes that from Swift Current to Java, 6·0 miles, is double track; Java is the junction with the Empress sub-division, while Dunmore connects with the Lethbridge sub-division; and from Larkhall to Medicine Hat is controlled by the "Staff System Absolute and Permissive." Alongside the station column is a mileage table from Swift Current, and letters denoting the telegraph and telephone offices and the code telegraph calls.

All trains are included, even those from the branches, which only apply for a few miles at

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the ends of the division. Type used is large, as permitted by the fact that there are only 11 columns for westbound trains and 10 for eastbound.

The following notes appended to this table will be perused by readers at home with interest.

Registering Points: Swift Current, Dunmore, Medicine Hat.

Bulletin Points: Swift Current and Medicine Hat.

Comparison clocks: Swift Current (Yard Office, Engine House); Medicine Hat (Yard Office, Dispatchers Office, Engine House).

§ No. 3 will stop to allow passengers from east of Swift Current to detrain.

All trains will approach and pass through Medicine Hat, Dunmore and Swift Current yards prepared to stop unless main track is seen or known to be clear.

All eastbound Freight Trains approach Java under full control expecting to find Empress sub-division trains using crossover to eastbound track on Medicine Hat sub-division.

Normal position of switches at the end of double track shall be when set for trains leaving single track for double track and against trains leaving double track for single track.

Double track extends from Swift Current to Java, mileage 6·0. Trains must keep to the right unless otherwise directed.

When passenger trains meet at Maple Creek the train taking the siding will use the house track just south of main track and west of station.

When passenger trains meet at Dunmore the train taking the siding will use the passing track just south of the main track.

Trains are operated by Electric Train Staff System, absolute and permissive block, between Dunmore and Medicine Hat.

Train Classification.

He dings further specify the respective trains as "951, Coast Freight," "975, Alberta Freight," etc., in a classification as "third class trains"; "669, Mixed, Mon., Wed. and Fri." as a "second class train"; and "13 Psg'r." and other similar numbers constitute the "First Class Trains." These classes apply, of course, to traffic classification, and not to classes of passengers conveyed. Other notes specify whether trains run daily, except Sundays, or on particular days only.

Page 3 gives similar particulars of the Calgary sub-division with eight train columns in each direction and with notes to the right. Page 4 is in three divisions, applying respectively to the Empress (one train each way, Mixed, Mon., Wed. and Fri., westbound, eastbound on Tues., Thurs. and Sat.), Bassano (one train each way, Mixed, Tues. and Fri. westbound, and Mon. and Thurs. eastbound), and Irricana (one train each way, Mixed, Wed. and Sat. both directions) sub-divisions. Each table has its own set of notes, and Mr. Crickmay remarks that a new relieving line is now available from Bassano to Swift Current, on the main route.

Page 5 includes tables for the Suffield, Gleicher and Langdon sub-divisions; page 6 the Lethbridge sub-division; page 7 the Crows' Nest and Macleod sub-divisions; page 8 the Aldersyde and Stirling sub-divisions and the Coutts and Cardston sub-divisions of the Raymond section.

Page 9 is devoted to the Calgary terminals, and Mr. Crickmay points out that the whole of the lines concerned are double-track and governed by signals. All switches are worked from signal towers, about five in number and the electric block signal system is installed. At Calgary there are three platforms and five working tracks in the station. Attention may be directed to the following notes applying here:—

Yard engines have the right to work on main tracks between Elbow River bridge and Fourth Street West on the time of all trains, but on their approach must clear the track as soon as possible.

All trains must be under full control within Calgary Terminals, expecting to find tracks occupied or switches wrong, and be prepared to stop at once.

Extra precaution must be observed approaching crossovers west end of Bow River bridge, 1·5 miles west of Ogden, and end of Elbow River bridge, 1·4 miles west of Alyth.

Train order signal at Alyth will not govern first and second-class trains.

Normal position of switches at the end of double track shall be, when set, for trains leaving single track for double track and against trains leaving double track for single track.

Sub-divisions.

On page 10 the trains of the Laggan sub-division of the main line are dealt with; page 11 applies to the Red Deer sub-division; and page 12 to the Edmonton sub-division. It is noted here that trains are operated by electric train staff system, absolute block, between Strathcona and Edmonton, while here and elsewhere in the tables are noted "Railway crossing at grade with Canadian Northern Railway, interlocked," with a specification of the location of such crossing.

Other sub-divisions receive attention on pages 13–16, and notes as to speed restrictions—usually stated as "trains must not exceed one mile in 2 minutes"—and spurs to mines, gravel pits and lumber depôts are included throughout the tables as required. Page 17 includes instructions as to connections between passenger trains at various places, and special instructions governing the Laggan sub-division. Among these may be noted the following:—

All trains will exercise caution when passing following points (specified in detail).

Trains will keep at least ten minutes apart between Canmore and Field, except when Automatic Block Signals indicate block clear to next signal in advance and otherwise observe Rule 91.

It is the duty of conductors to see that windows, ventilators, and doors are closed, and that at least one lamp is burning in each compartment of each car, when passing through tunnels 128·8 and 131·0, between Hector and Cathedral. Enginemen must have their headlights burning and engine bell must be kept ringing when passing through these tunnels.

At Cathedral or Yoho all westbound freight trains will stop and make test in accordance with Rule 28-C, of Rules for the Operation and Inspection of Air Brakes. If any wheels are excessively heated,

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they should be allowed time to cool, and then be closely watched until the foot of the grade is reached.

All trains will be governed by Electric Block Signal System between Field and the distant signal thirty-five hundred feet east of east switch at Stephen.

When a train finds an absolute block signal indicating "Stop," it must stop before reaching the signal, and not more than two hundred feet (200 ft.) from it. It may proceed when the signal is cleared, or if not immediately cleared, by obtaining authority from the train dispatcher. If unable to communicate with the train dispatcher, the train may proceed under protection of flag to the first signal that indicates "Proceed."

When a train finds a permissive block signal indicating "Stop," it must stop before reaching the signal, and not more than two hundred feet (200 ft.) from it. It may then proceed at once with caution, expecting to find the track occupied, a car foul, a switch open, a broken rail, or other obstruction in the block, except when train is proceeding under flag from last absolute block signal as mentioned above.

Speed Orders and Locomotive Working.

On page 19 are special instructions governing the movement of trains by the electric train staff system, and general instructions as to meeting points, times when telegraph offices are open, employees riding on the top of cars passing under bridges, detail of steep grades, switches, passage of crossovers, working of "snow plows," and the like; while the last page is given over to a comprehensive table of speeds specified thus:—

Time per mile.	Miles per hour.
1 min. 0 sec.	60·00
ranging from this rate down to	
12 min. 0 sec.	5·00

Mr. Crickmay further writes as follows:—"Several engineers were much interested in the picture of the 4–8–2 '2900' class in the current number (September, 1915) of the Railway Magazine, and the driver of No. 2087, 4–6–0, told me yesterday that the 2900's are to work East in the Montreal division. Our biggest machines here are 2–8–2 engines of the 5000 class and I saw one of them run in on No. 14 a few weeks back with 16 cars on on time. They also hauled some troop trains out of here to Medicine Hat with 17 cars on. Owing to the 'Frisco Exhibition all the transcontinentals are packed and running in two or three sections and one day recently 16 trains were hauled through the mountains by the Canadian Pacific Railway alone. Recently I went West on the second section of No. 13, and No. 583 4–6–0, with 10 cars on, easily made up 50 min. from Banff to Revelstoke. Almost without exception it is a point of honour with Canadian Pacific Railway drivers to make up time, and I should know, as in the last 18 months I've run about 70,000 miles behind them."

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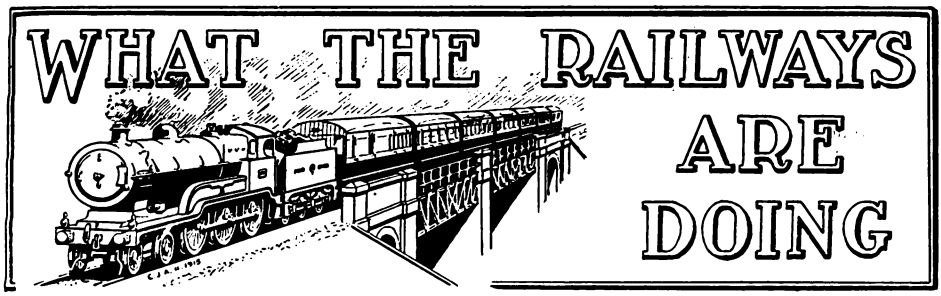
WHAT THE RAILWAYS ARE DOING



THE annual distribution of prizes to the successful students at the classes of the Horwich Mechanics' Institute during the session 1914–15, took place on Wednesday, December 15th, in the large hall at the Institute. Only the students to receive awards were present, along with several members of the Institute's teaching staff and Committee. Mr. Geo. Hughes (Chief Mechanical Engineer) Lancashire and Yorkshire Railway, presided, and the Institute secretary and librarian (Mr. J. McLean) was also present.

The Chairman, before proceeding to distribute the prizes, announced that the Institute Committee had created the position of Principal of the Technical School, and appointed Mr. McLean in addition to his present position as secretary and librarian. He then referred to the demands made on their members and students by the European War. Five of the prize winners were absent by reason of having enlisted in the Army—Messrs. Hamer Crompton, William Harold Roebuck, Frank Cyril Hullah, Edwin Cross, and Fred Walsh. Their roll of honour also included Messrs. W. S. Montgomerie and Stanley Boardman (teachers), Ernest Roberts (assistant librarian), and Charles T. Notman and Philip Britton (rifle range attendants). Altogether 242 members of the Institute were in the Army. Amongst the students about 100 had enlisted, but most of those were also Institute members. The total number of persons who had been associated with the Institute as members, students or staff since the war began and were now in His Majesty's Forces, exceeds 260. Mr. Hughes concluded by mentioning that Samuel Burgess, and probably Robert Stones, both prize winners there last year, had made the great patriotic sacrifice.

* * *

AT a meeting of the Institution of Locomotive Engineers held at Caxton Hall on Saturday, December 18th, the Chairman, Mr. A. R. Bennett, Vice-President, announced that the certificate of incorporation had been received from the Board of Trade, and that the Institution was, therefore, fully constituted as an incorporated Association. He also read a letter from Mr. R. E. L. Maunsell, chief mechanical engineer, South Eastern and Chatham Railway, accepting as already announced, the position of President for 1916.

After the completion of other formal business, including nominations for Vice-Presidents and in place of retiring members of the Council, the Chairman called upon Mr. E. J. H. South to read his paper, on the "Cleaning of Locomotive Boilers." This aroused an extremely interesting discussion. Mr. J. H. Burnett, late Locomotive Superintendent of the Metropolitan Railway, opened, and was followed by Mr. Sanderson (London representative of the Baldwin Locomotive Works), Messrs. Lelean, Graham, Mannering, Gairns, Dearburg, and others.

* * *

AN agreement, dated December 10th, has been made between the North British Railway Company and Messrs. Mutter, Howey and Co., carting contractors, Edinburgh, which firm have carried on business in Edinburgh for many years, and have acted as carting contractors for the North British Railway in many Scottish towns. The agreement is for the purchase of the business, at a price of £63,677 6s. payable within one calendar month after the date of transfer, July 1st, 1916, or such other date as may be fixed by agreement, or by Parliament. The purchase price is to include the whole property and assets of the firm, comprising, *inter alia*, heritable properties owned by them in Charlotte Street and John Street, Aberdeen, and in South George Street, Dundee; the firm's whole rights and interests under lease as missives of let in subjects at Bathgate, Dundee, Edinburgh, Kirkcaldy, Newcastle, and Selkirk; horses and plant; and the goodwill of the business. The agreement is contingent on the Company obtaining its confirmation by Parliament and statutory power satisfactory to them to continue and carry on the said business in all its branches and departments.

* * *

ON Tuesday, December 14th, the "James Forrest" lecture, on "Electrical Railways," prepared by Mr. Henry Metcalfe Hobart, was delivered in abstract at the Institution of Civil Engineers by Mr. J. A. F. Aspinall (General Manager, Lancashire and Yorkshire Railway), the author being at present in the United States. The President, Mr. Alexander Ross, mentioned that Mr. James Forrest, who had now entered his ninety-first year, and had been for seventy-three years associated with the Institution, had sent him a message of greeting to the members. The paper, which is an exceptionally valuable one as an economic and technical study, after briefly reviewing development from the City and South London Railway, the first exclusively electric railway, opened in 1890, until recent years, dealt mainly with Butte Anaconda and Pacific and Chicago, Milwaukee and St. Paul freight traffic electrification.

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MR. J. J. RICHARDSON.

Who has retired from the position of Outdoor Locomotive Superintendent, London, Brighton and South Coast Railway.

THE 1916 Calendar issued on behalf of the railways, omnibuses and trams associated with the Underground Electric Railways Company of London, Ltd., carries on the artistic standard of publicity which has become characteristic of all material issued from Electric Railway House. On the twelve cards are reproduced in colours smaller versions of the beautiful series of posters issued some time ago, and setting forth the floral beauties of various districts during the respective months of the year. The posters were interesting, but on a smaller scale they are even more artistic, and the Publicity Department is to be congratulated upon this addition to the notable series of calendars previously produced.

* * *

WITH the retirement of Mr. J. J. Richardson the Brighton Company loses one of its most popular officers attached to the locomotive department. On December 29th next, Mr. Richardson attained the age of 60 years, 48½ of which he had spent in the employ of the London, Brighton and South Coast Railway.

Born at Brighton, he was apprenticed under his father, Mr. Albany Richardson, locomotive superintendent of the works at Battersea. In 1878 Mr. John James Richardson was appointed locomotive foreman at the Battersea Works, later assistant district locomotive superintendent, and in 1898 succeeded his father. In 1901 he became outdoor locomotive superintendent of the line with offices at Brighton, thus returning to his native town, and has uninterruptedly carried out the important duties of that position ever since. Among numerous offices he filled was that of hon. secretary to the George Stephenson Centenary Festival at the Crystal Palace on June 9th, 1881, under the patronage of the then Prince and Princess of Wales, and by his energy and perseverance succeeded in raising the handsome sum of £234 for the Railway Servants' Orphanage at Derby. Mr. Richardson also acted as secretary to the London and Suburban Railway Officials' Association. Mr. Richardson held this office for over 20 years, and on his retirement was presented at the Criterion Restaurant on February 22nd, 1902, with an illuminated address and a handsome cheque, in recognition of his valuable services. This meeting was attended by upwards of 250 gentlemen, representing 13 railways, and was presided over by Sir William Forbes, General Manager, London, Brighton and South Coast Railway.

Highly interesting experiences have fallen to Mr. Richardson. In 1876 he was selected by Mr. Stroudley, the then locomotive superintendent, to travel on the footplates of engines working Royal and other specially important trains, and he has acted so ever since, having probably had charge of more Royal train engines than any other living railway servant. Mr. Richardson is especially proud of the possession of a medal presented to him by His Majesty King George "to be worn in remembrance of Their Majesties' Coronation."

At the time of Mr. Richardson's apprenticeship there was no general manager, but a traffic manager, Mr. George Hawkins, with Mr. Frederick Slight as secretary. Since then he has worked under four general managers, namely, Mr. J. P. Knight, Sir Allen Sarle, Mr. J. F. S. Gooday, and Sir William Forbes. Mr. Richardson's eldest son, Albany, is the locomotive engineer of the Emu Bay Railway, Tasmania; whilst his youngest son, John, assists his father in his important duties.

Following his retirement Mr. Richardson was received by the King at Buckingham Palace, when His Majesty conferred upon him the Victorian Order.

* * *

DURING the past twelve months only two types of locomotives have been augmented on the Great Western Railway, the 2-6-2 T and

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2-6-0. Progress in the fitting of the Swindon superheater has been maintained, a large number of boilers so treated being available; and as the smaller boilers of the older classes of engines are gradually being equipped, the saving of coal—more than ever important in view of the present restricted supplies and high prices—effected by the superheating system is considerable, whilst further relief is afforded by the lessening of repairs, due to the use of the top feed. In consequence of shortage of skilled labour it has been found necessary to modify the style of painting the locomotives and tenders. For the present, the highly finished standard green, with lining, is discontinued, except in the case of express passenger engines, the substitute being khaki, with unrelieved black for the underframings, etc. It is worthy of note that of the fleet of the once famous 7 ft. 8 in. "single" wheelers, only one, No. 3074, now remains in traffic.

* * *

By an Order in Council dated November 30th, 1915, issued under the Defence of the Realm (Consolidation) Regulations and applicable to British subjects as well as alien friends, it is directed that a person coming from or intending to proceed to any place out of the United Kingdom shall not, without the special permission of a Secretary of State, land or embark at any port of the United Kingdom unless in possession of a valid passport issued not more than two years previously or, if coming from a place outside the United Kingdom, either a passport or other document establishing his or her nationality and identity, and a photograph is to be attached to all such passports or documents of identity. This regulation does not apply to passengers of British nationality travelling to and from Ireland or to and from the Isle of Man, nor to members of His Majesty's land and sea forces travelling in uniform, but it applies to all passengers (except members of His Majesty's Forces) travelling to or from the Channel Islands.

In addition to these restrictions, alien passengers are not allowed (except by special permission of a Secretary of State) to travel in either direction by the following steamer services:—

Fishguard and Rosslare,
Fishguard and Waterford,
Fishguard and Cork,
Bristol and Cork,
Weymouth and the Channel Islands.

It has been found necessary to request station masters, agents, and booking clerks to question passengers intending to book from stations in England and Wales to stations in Ireland or the Channel Islands, or *vice versa*, as to their nationality, and if they are aliens to inform them they cannot travel by the routes mentioned. If they are alien friends, however, they can be directed to one of the approved ports, amongst which are London, Folkestone, Falmouth, Bristol, Holyhead, Liverpool, and Southampton.

* * *

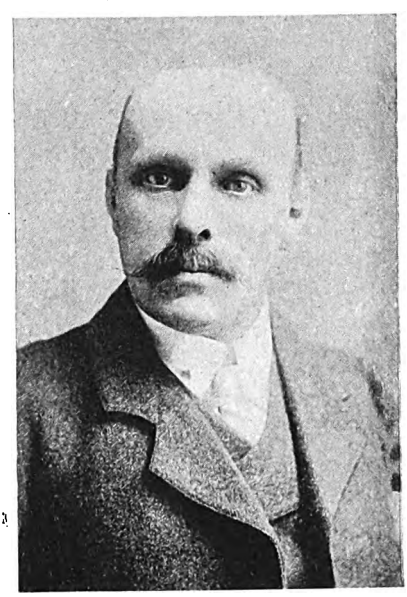
On Sunday, December 19th, a serious fall of cliff on the eastern side of Wear Bay, between Dover and Folkestone, adjacent to "The Warren," caused a block of the South Eastern route to Dover. The magnitude of this landslide is such that only the one which occurred in 1877 can be compared with it. In January, 1877, the line was closed for three months owing to a similar landslide. For the purposes of local communication a service of motor 'buses is running between Folkestone and Dover. For some time to come, however, it will be necessary to work all the Dover traffic *viâ* the Chatham route, though as Folkestone is also of great importance, it is fortunate that its traffic can still be dealt with by the easier route.

* * *

Mr. W. H. Woodward, Assistant Portmaster at Grimsby, Great Central Railway, died on October 23rd. Born in 1854, he joined the Goods Manager's staff at Manchester in 1874, was transferred to Grimsby Town Goods station in 1875, and appointed chief clerk to the Portmaster, Colonel Jas. Reed, in 1882, subsequently working under Mr. W. Alford Green, Mr. T. M. Williams (now dock and marine manager of the London and South Western Railway at Southampton), and Commander Barwick, R.N. He was transferred to Immingham on the opening of the King's Dock, and contributed largely to the success attending the inauguration of that great scheme. A portrait of Mr. Woodward is reproduced by courtesy of our Great Central Railway contemporary.

* * *

During the recent heavy rains a landslide occurred on the riverside electrified branch of the North Eastern Railway, between Newcastle Central and North Shields, near Lant's Quarry.



THE LATE MR. W. H. WOODWARD,
Assistant Portmaster, Grimsby, Great Central Railway.

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A portion of the railway embankment was dislodged and the traffic temporarily interfered with. On the Isle of Wight Railway, from similar causes, several tons of earth fell from an embankment across the line between Sandown and Brading. Breakdown gangs worked throughout the night, and pending the restoration of train working, communication was maintained by motor and horse 'buses.

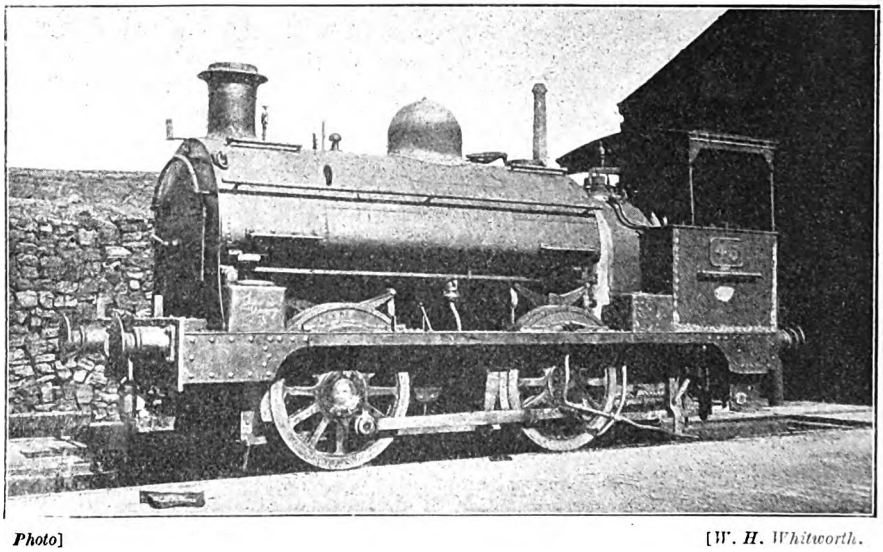
* * *

A SECOND line of rails has been completed and brought into use on the Great Western Railway main line between Gwinear Road and Angarrack Viaduct; on the upper section of the Penar Branch between Penar Junction and Gwrhay, and also on the Morriston Branch, on the short length between Morriston Station and Pentrevelin signal box. On the Birmingham line between Small Heath and Bordesley material progress has been made with the important widening works in hand.

down single line, controlled by tell-tale block with signals for entering and leaving, worked at one end from the new signal box at Spelter Works, and at the other end from a new signal box at Plas Marl. The interlocking between the two boxes is obtained by means of interlocking levers controlled by track circuit which is installed throughout the loop. Arrangements have been made for switching out the Spelter Works box, when the loop will be out of use and the section between Plas Marl and Morriston worked on the electric token system.

* * *

OF a new series of 4–6–0 main line passenger engines (" Prince of Wales " class) now in hand at Crewe, we understand that the first four to be completed are Nos. 27 *General Joffre*, 88 *Czar of Russia*, 122 *King of the Belgians*, and 160 *King of Serbia*. No. 2583 (" Precursor " class), which recently had its name changed from *Teutonic* to



Photo] [*W. H. Whitworth.*

0-4-0 SADDLE TANK ENGINE NO. 45 : LONDON & NORTH WESTERN RAILWAY.

MR. W. L. KENNING writes, in reference to a remark on page 78 of the January RAILWAY MAGAZINE to the effect that shed plates are being placed inside the cabs of South Eastern and Chatham Railway locomotives, that the shed numbers are painted inside the cab, one on each side about level with the windows. They are painted chiefly in red paint, but also in white and black. 11 shed is Deal and Dover. 18 shed includes Ash, besides Reading.

* * *

THE new goods loop between Spelter Works and Plas Marl on the Morriston Branch, Great Western Railway, has been completed, and is about to be brought into use. The signalling arrangements for this loop have presented problems of much interest. The loop is an up and

The Tzar, is re-named *Moonstone*. Further additions to the new 4–6–0 series are :—Nos. 185 *King of Italy*, 877 *Raymond Poincare*, 1333 *Sir John French*, 2275 *Edith Cavell*, 2396 *Queen of the Belgians*, and 2408 *Admiral Jellicoe*. For the present these engines are all stationed at Crewe, but eventually two (including No. 877), will be stationed at Camden, and two others at Rugby. The scrapping of Mr. Webb's 5 ft. compound mixed traffic engines is now being carried out with remarkable rapidity, only 8 of the 30 engines being at work at the time of writing. These are Nos. 504, 511, 545, 695, 1113, 1407, 1379 and 2059. One of the 18 in. goods class, No. 1798, has recently been fitted with slide valves in place of piston valves. No. 956 *Dachshund* (4–4–0 type) has been re-named *Bulldog*.

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FOLLOWING the example of several of the English railways in the case of ambulance trains built by them for the Continent, the East Indian Railway recently arranged for an exhibition of an armoured train constructed some little time ago at their Lillooah shops for service on the North-West Frontier.

* * *

AT Paddington station, Great Western Railway, the large roof span over platforms Nos. 9, 10, 11 is nearly completed, the new up parcels depôt has been brought into use, and the widening of the arrival approach has been completed.

* * *

CLOSING of the Oldbury and Brentford branches for passenger traffic has been followed by a proposal to convert these sections of the Great Western Railway system temporarily to single lines, giving up one line in each case for siding accommodation. This has been put in hand, the arrangements being such that it will be possible to revert to the usual working with very little trouble at any time this may be desirable.

* * *

AT a meeting of the Railway Students' Association, London School of Economics (University of London), Clare Market, W.C., on Friday, December 10th, Mr. E. B. Creasey, chief clerk to London district manager, Great Northern Railway, gave an address on the subject of "Divisional v. Centralised Railway Management."

* * *

MR. W. SLATER, Deputy Assistant Goods Manager, Lancashire and Yorkshire Railway, was recently presented by Mr. Marriott, Chief Goods Manager, on behalf of the goods manager's office staff in Manchester, with a wedding gift consisting of a silver tea service and a lady's leather satchel. A silver tray, subscribed for by several Lancashire and Yorkshire superintendents and agents in England and Ireland, was also presented to Mr. Slater.

* * *

THE Birmingham Train Control system, Great Western Railway, has been extended to Banbury. The Telephone Train Control systems at Swansea and Reading have been completed, while that at Cardiff is well in hand. Semi-automatic signalling has been installed at Flax Bourton, dispensing with Flax Bourton Cutting signal box.

* * *

LARGE schemes of track circuiting are in hand on the Great Western Railway, among which are included Reading, Westbury, Pontypool Road, Newbury, Oxford, Didcot, and Gloucester. 38,000 accumulators for working track circuits, electric signals, etc., were charged during last year, as against 26,000 during 1914, an increase of 12,000—a sufficient indication of the progress made in this particular direction, in spite of considerable difficulty in obtaining necessary materials.

MR. S. WILLIAMSON, General Manager, Cambrian Railways, in presenting prizes given by the Chairman of Directors, Lieut.-Col. David Davies, M.P., to railway ambulance men at Welshpool, said that out of a total staff of 2,000, the Company had at least 12 per cent. serving with the Colours.

* * *

CAPTAIN HENRY WILLIAM HEMMINGS, the Great Western Railway Assistant Marine Superintendent at Weymouth, retired on December 31st, at the age of 71. He had held this position for the past 26 years, having been appointed to it in June, 1889, immediately prior to which he was commodore captain of the London, Brighton and South Coast Railway's Newhaven and Dieppe fleet of steamers.

* * *

VISCOUNT PEEL, of The Lodge, Sandy, Bedfordshire, has been elected a Director of the Great Northern Railway Company in place of Sir Lesley C. Probyn, K.C.V.O., who has tendered his resignation.

* * *

AT a meeting of the Great Western Railway Directors, Mr. Francis Bingham Mildmay, M.P., was elected to the Board in succession to the late Colonel the Hon. Charles E. Edgcumbe, Mr. Mildmay, who has been the Unionist Member for Totnes (Devonshire) Division since 1885, was born in April, 1861, and educated at Eton and Trinity College, Cambridge. He is a lieut.-colonel in the West Kent Imperial Yeomanry, and is at present engaged as an interpreter with the British Expeditionary Force.

* * *

THE Board of the Railway Benevolent Institution with the concurrence of the railway companies, arranged for the usual New Year's collection on behalf of the funds. The more immediate object of the New Year's collection is for the casualty fund, to which in the year 1915 nearly 105,000 railway servants contributed, and from which claims to the number of 5,106 have been promptly relieved.

* * *

THE retirement under the conditions of the age limit of Mr. J. Landor Lowe, B.Sc., M.Inst.C.E., Assistant Engineer (New Works), Midland Railway, was on December 23rd made the occasion of an interesting presentation, subscribed for by his fellow officers in the engineer's department.

* * *

MR. S. WILLIAMSON, General Manager, Cambrian Railways, notifies that the premiums for the best kept stations during 1915 have now been approved by the Directors, and are as under: First premium of £3, Afon Wen; second premium of £2, Doldowlod; third premium of £1 10s., Pontdolgoch and Four Crosses; fourth premium of £1, Barmouth and Dovey Junction; fifth premium of £1, Llwyngwril. Premiums were further awarded for signal cabins and also for horses, harness and stables.

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WE regret to record the death of Mr. Charles Bill, a Director of the North Staffordshire Railway, and Chairman of the Leek and Manifold Valley Light Railway. Mr. Bill was a J.P. for the county of Stafford and Hon. Colonel of the 4th North Staffordshire Regiment. He had served on General Stewart's staff in the Ruby Mines Expedition in Upper Burma in 1886, receiving the medal with clasp. From 1892 to 1906 he was M.P. for the Leek Division of Staffordshire.

* * *

UNDER the auspices of "The T.O.T. Mutual Aid" Committee, representing the "Underground" Railways and associated agencies, Christmas entertainments (subsidised by the companies) are being promoted for the dependents of enlisted men. The first was given at the Public Hall, Lime Grove, Shepherd's Bush, on December 30th, the dependents invited being those belonging to the Tube Railway men resident in West and South-West London. Tea was provided at 4.30 p.m., to which over 700 mothers and children sat down, and this was followed by an entertainment. The Operating Manager (Mr. H. E. Blain) and the Superintendent (Mr. W. E. Blake) were present. Altogether six of these entertainments were arranged, three being held for District Railway dependents at the "Albert Stanley" Institute, Hammersmith, on January 3rd., 10th, and 17th, respectively, and the remaining two for the Tube dependants, one at Lambeth Baths for those living in South and South-East London, and the other at Prince of Wales Hall, Kentish Town, for those resident in the North and North-West districts.

* * *

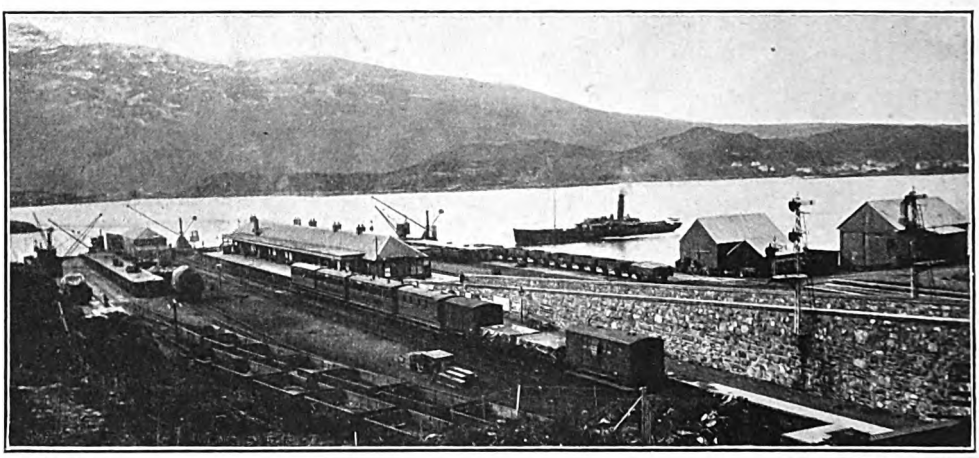
MR. GEORGE TAVENOR retired from the position of Chief Cashier of the Cheshire Lines Committee after completing fifty-one years' railway service on December 31st, 1915. Mr. Tavenor commenced his career with the Lancashire and Yorkshire Railway Company, at their Great Howard Street goods depôt, Liverpool, in 1864, and after serving that Company in various grades, left them to join the Cheshire Lines Committee at their head office, then situated in James Street, under the management of the late Mr. W. English. On the transfer of the chief office to the Central Station, Ranelagh Street, in 1874, Mr. Tavenor was appointed chief time-table and excursion clerk, and in 1893 he was promoted to be chief cashier to the Committee. Mr. C. H. C. Sewell, who has for many years been Mr. Tavenor's chief assistant, has been appointed Chief Cashier.

* * *

GREAT WESTERN RAILWAY stations and halts temporarily closed for passenger traffic are: Aberderfyn Halt, Abingdon Road Halt, Beavers Hill Halt, Bradley and Moxley, Brentford, Brentham, Bridport (East Street and West Bay), Brook Street Halt, Camerton, Charlton Halt, Combe Hay Halt, Dunkerton, Dunkerton Colliery Halt, Fennant Road Halt, Filton Halt, Garsington Bridge Halt, Great Bridge, Hallen Halt, Henbury, Hinksey Halt, Horspath Halt, Iffley Halt, Lydstep Halt, Madeley (Salop), Midford Halt, Monkton Combe, Oldbury, Old Oak Lane Halt, Pant Halt, Park Royal, Paulton Halt, Perivale Halt, Ponkey Crossing Halt, Preston Platform, Radford and Timsbury Halt, Stourbridge, Trumpers Crossing Halt, Wolvercot Platform, and Wynn Hall Halt.

* * *

OUR South Western contemporary mentions that the service of electric trains inaugurated on the Wimbledon Park line on October 25th



Photo] [*Urquhart, Dingwall.*

HIGHLAND RAILWAY: KYLE OF LOCHALSH, STATION AND PIER.

The Island of Skye is seen across the Kyle.

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last is giving great satisfaction, and the traffic is showing a marked increase. Good progress is being made with the electrification of the Hounslow line. On this section a new station is being constructed near Barnes Bridge on the Surrey side of the river, which will be of great utility to the locality, the existing station at Barnes being situated practically on the common, and consequently somewhat remote from the residential quarter. When completed, the two platforms will be 400 ft. in length, sheltered from the weather by roofing and screen walls, and provided with waiting-rooms and other offices. The booking hall and office will be at the ground level, and the station frontage has been designed with a combination of facings of stone and red brick, with an ornamental iron and glass awning.

* * *

THE Board of Management of the Railway Benevolent Institution at their last meeting passed a resolution inviting Mr. J. J. Petrie, Traffic Manager, Midland and Great Northern Joint Railway, to occupy the vacant seat on the Board rendered vacant by the death of Mr. J. Light, late director Metropolitan Railway, who became a member of the Board in 1896.

* * *

MR. S. J. MEDCALF has been appointed Manager of the Great Southern and Western Railway's Hotels and Refreshment Rooms, which have now been taken under the company's own management as from January 1st, 1916.

* * *

MR. W. PARKER presided at the Annual General Meeting of the Railway Club, held at 92, Victoria Street, Westminster, London, S.W., on Tuesday, January 11th. The annual report was a good one, seeing that the year which has closed has not been conducive to progress, and a considerable percentage of the members are serving with the Colours, while conditions are not such as to favour many additions. Meetings, have, however, been maintained and the situation as a whole is satisfactory. The balance sheet showed that the Club is financially stable, the balance carried forward being, in fact, a slight increase upon that with which the year 1915 commenced. After the election of officers, which involved no changes, and other formal business, Mr. Parker, the president, gave an address dealing with railway conditions before the war and some of the probable changes which will be seen afterwards. At the meeting on February 14th, Mr. G. W. J. Potter will read a paper, illustrated with examples of signal spectacles, etc., on "The Colour of Railway Signals."

* * *

ON December 3rd last, Mr. Alfred Chas. Hutcherson was entertained at luncheon in the Abercorn Rooms, when the opportunity was taken of presenting him with a gold watch and chain, subscribed for by the Chief Officers of the Company. Mr. Thornton (General Manager) presided and was supported by Mr. Wm. C. May (Chief Traffic Manager) and other officers. A portrait of Mr. Hutcherson, late Cambridge District Goods Manager, appeared in our October, 1915, number. Mr. Thornton, in making the presentation, referred to the length of Mr. Hutcherson's service, and dwelt on the affection for the ex-Cambridge District Goods Manager on the part of all his co-workers and the mutual respect existing between him and the public. Mr. May, as Mr. Hutcherson's immediate Chief, associated himself with all the General Manager had said, and from his long friendship with Mr. Hutcherson added a more personal note.

* * *

OUR Great Eastern contemporary introduces, in its January number, a "censored" article on locomotive construction; but we strongly suspect either that an accident occurred in reference to Fig. 1, represented by a blank explained as "[Excision by Censor]," and a censored reference to the loading gauge, the sentence in question becoming phrased thus:—"The loading gauge—[Excision by Censor] an apparatus which will convert a very large amount of water into steam . . ." Otherwise the question arises whether loading gauge dimensions, available from many sources, now constitute information which *may* be "useful to the enemy."

* * *

IN 1914 the Underground Railways issued a pictorial map of London in the old style, in which the names of the various streets and buildings were treated in a fantastic manner by taking the literal meaning of the name of the place, or some association, illustrating it with figures and incident. The same designer, MacDonald Gill, has just prepared a second map in the same manner, taking Theatreland this time as his subject, and it may now be seen on the various Underground stations. Not only is the design itself attractive in colour scheme and general arrangement, but we imagine that many trains will be missed by those who once start to examine its curious detail. The usefulness of the map at the present season is brought home by a bill in bright Harlequin colours, which forms a companion. On the central black panel of this design are set forth the merits of the Underground as a "scene-shifter from home to the lands behind the curtain."

* * *

LIEUT.-COL. SIR HERBERT WALKER, General Manager, London and South Western Railway, and Acting Chairman of the Railway Executive Committee, has been added to the Commission of Lieutenancy for the City of London. A portrait of Sir Herbert in full official uniform is a feature of the January number of our South Western contemporary.

* * *

ON December 14th, at Liverpool Street, Captain Henderson, late Harbour Master at

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Lowestoft, was presented by Mr. H. W. Thornton, on behalf of the Officers of the Company, with a canteen of cutlery and other gifts. A number of the Directors were present with the Officers.

* * *

Mr. Albany B. Richardson, son of Mr. J. Richardson, Out-door Locomotive Superintendent, London, Brighton and South Coast Railway, has been appointed to succeed Mr. A. E. Mawson as Locomotive Superintendent of the Emu Bay Railway, Tasmania.

* * *

Inspection of stations in connection with the annual platform garden competition on the Portpatrick and Wigtownshire Joint Railways took place on August 5th, and the prizes have just been allotted in the following order of merit: Creetown, Millisle, Newton-Stewart, Glenluce, Sorbie, New-Galloway, Crossmichael, Stranraer, Kirkcowan, Castle Kennedy, Gatehouse, Palnure and Parton.

* * *

Prizes for the best-kept platforms at the stations on the Somerset and Dorset Joint line have been awarded in the following order: Bailey Gate, Midsomer Norton, and West Pennard, Glastonbury and Pylle, Evercreech (New) and Masbury.

* * *

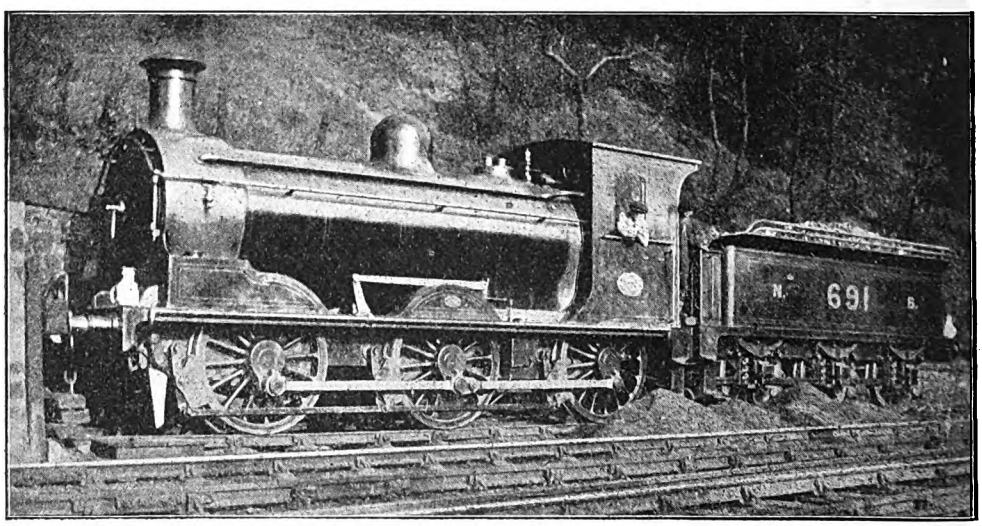
In view of the completion of the electric power station at Wimbledon, the London and South Western Railway have decided to shut down the generating station of the Waterloo and City line very shortly, the power supply therefore being obtained from the Wimbledon station.

* * *

Yet another instance of the utilisation of leading railway officers for national purposes. The Board of Trade announces that the Prime Minister has appointed a committee to inquire into difficulties and congestion arising from time to time at harbours, ports and docks (including dock sheds and warehouses) in the United Kingdom, etc. The committee is constituted as follows:—Lord Inchcape, G.C.M.G., K.C.S.I., K.C.I.E. (Chairman); Mr. Graeme Thomson and Major T. H. Hawkins (Admiralty); Brigadier-General Hon. A. R. Montagu Stuart-Wortley, C.B., D.S.O., War Office; Sir Frederick Bolton, Mr. J. G. Broodbank, Sir Sam Fay (General Manager, Great Central Railway), Sir Edward Hain, Sir A. Norman Hill.

* * *

Sir Arthur Yorke, C.B., late Chief Inspector of Railways, Board of Trade, and a Director of the Great Western and the South Eastern and London, Chatham and Dover Companies, has been elected a Director of the Grand Trunk Railway Company of Canada in place of the late Lord Welby.



REBUILT GOODS ENGINE NO. 691: NORTH BRITISH RAILWAY.

* * *

It has been decided to close the station at Bluestone, between Corpusty and Aylsham, on the Midland and Great Northern Joint Railways. The villages hitherto served by this station will be accommodated by other neighbouring stations without inconvenience.

* * *

Mr. H. Browning Button, Cambrian Railways' District Traffic Agent for the Midlands, delivered an interesting lecture, entitled "The Romance of Railways in Peace and War," illustrated with lantern slides, in Birmingham, on January 12th. There was a large attendance of railwaymen and their friends from the three Birmingham lines, and also from seven of the lines represented in that city. Mr. Browning Button said the subject of railways was specially interesting at the present time in view of the

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supreme part they were taking in the world's greatest war. Since August, 1914, all transport records had been eclipsed, and when the history of the war was written it would be found that our railways and our railwaymen were responsible for a large share in the great victory ultimately achieved by British arms. In referring to the various railway publications Mr. Browning Button remarked that the RAILWAY MAGAZINE had been largely responsible for the more general knowledge of railways which was now current, and quite a large number of copies were sent every month to railwaymen and others serving in His Majesty's forces on land and sea. Reporting the meeting, held in the Temperance Hall, the *Birmingham Gazette* referred to an announcement then made that the Great Western Railway intended to erect at Tyseley an institute similar to those they have at other large centres. The war had for the moment suspended it, but on the signing of peace it would be proceeded with.

* * *

AT the conclusion of the ordinary business of the Irish Railway Managers' Conference on Saturday, January 15th, a presentation was made to Mr. A. G. Reid, on the occasion of his retirement from the positions of General Manager and Secretary of the Dublin and South Eastern Railway Company. Mr. M. F. Keogh, General Manager, Midland Great Western Railway and Chairman of the Conference, presided, and in making the presentation referred to Mr. Reid's long and varied railway experience and to the cordial relationship which always existed between him and his late colleagues. His sound judgment and advice had been of the greatest value at the various meetings of the Conference, of which he was Chairman during the year 1910, and his kind and courteous manner had been much appreciated by all with whom he came in contact. Mr. Keogh's remarks were endorsed by Mr. J. Bagwell, General Manager, Great Northern Railway (Ireland), Mr. W. H. Litchfield, Traffic Manager, City of Dublin Steam Packet Company; Colonel Henry Plews, Director, Great Northern Railway (Ireland), Mr. J. Tatlow, Director, Midland Great Western and Dublin and Kingstown Railways; and Mr. J. Ingram, Secretary, Irish Railway Clearing House. Mr. Reid, in replying, mentioned that he had completed 53 years of railway service. He commenced his career on a small station on the London and North Western Railway. After having occupied various positions on that line and also on the North Eastern Railway, he became Superintendent of the Great North of Scotland Railway, and some 16 years ago came to Ireland as General Manager of the Dublin and South Eastern Railway, to the duties of which position those of Secretary were added some years ago. He characterised the life of a railway official as intensely interesting, often very anxious, but never dull. He had very pleasant memories of his association with the Irish Managers' Conference, and trusted that, although the opportunities for meeting his old colleagues would not be so numerous in the future, he would still retain their friendship. The presentation consisted of a very beautiful and imposing two-handled silver rose bowl of purely Irish design, the upper part, or top, consisting of a band of Celtic interlaced panels separated by boldly treated bosses after the style of the celebrated Ardagh Chalice. On either side of the body there is a similar type of decoration in the form of medallions, the centre of one being left plain to take the inscription. The base is formed by a Celtic band resting on four dragon feet and the handles represent a pair of heraldic dragon heads. The bowl is accompanied by a set of four silver flower vases, and a soup tureen copied from an old Sheffield one.

* * *

AN interesting photograph is reproduced showing a fleet of Napier Ammunition Wagons, part of a large batch delivered to His Majesty's Government. The chassis in every case is the well-known 20 h.p. extra strong Colonial Napier, which on ambulance and staff car duty has earned a big reputation on the various Allied fronts. The special duty of these vehicles is to carry ammunition as near as possible to the firing line. It will be agreed that this is a very arduous task, and for such service only cars of the utmost reliability could be chosen.

* * *

BOGIE single and 2–4–0 engines are being used for assisting coal trains on portions of the Midland Railway. We understand that for this purpose a number of the earlier 4–2–2 single engines with 7 ft. 4 in. and 7 ft. 6 in. driving wheels are now stationed at Toton, together with a few of the 2–4–0 engines.

* * *

RECENT locomotive withdrawals on the Great Western Railway include Nos. 75 and 808 (old 2–4–0's); 46, 434, 612, 682, 1100, 1114 and 1186 (old double-framed 0–6–0 goods); 573 (0–4–2 tank); and 1677 (0–6–0 saddle tank). Four of the 7 ft. 8 in. 4–2–2 "singles" were also broken up during 1915, these being Nos. 3039 *Dreadnought*, 3050 *Royal Sovereign*, 3060 *John G. Griffiths*, and 3062 *Albert Edward*. Twenty new 2–6–0 Mixed Traffic engines have recently been constructed at Swindon and are numbered 4361-4380. There are now 80 of these useful engines at work on the Great Western Railway, in addition to 81 locomotives of a similar type, which are used only on heavy mineral trains.

* * *

Two more of the large 4–6–0 express locomotives of the London and South Western Railway, Nos. 443 and 445, have been fitted with Eastleigh superheaters and extended smoke-boxes.

* * *

THE Great Western Railway Directors have granted the sum of £300 for prizes for the best

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kept station gardens during 1915. The number of competing stations was 474—a decrease of two as compared with last year, and the amount awarded was apportioned between 190 stations divided into special and ordinary classes. The stations which gained the special prizes of £5 each are :—Langley, Freshford, Bridport, Torquay, Perranwell, Dymock, Chepstow, Haverfordwest, Penpergwm, Stoke Edith, Hall Green and Gresford.

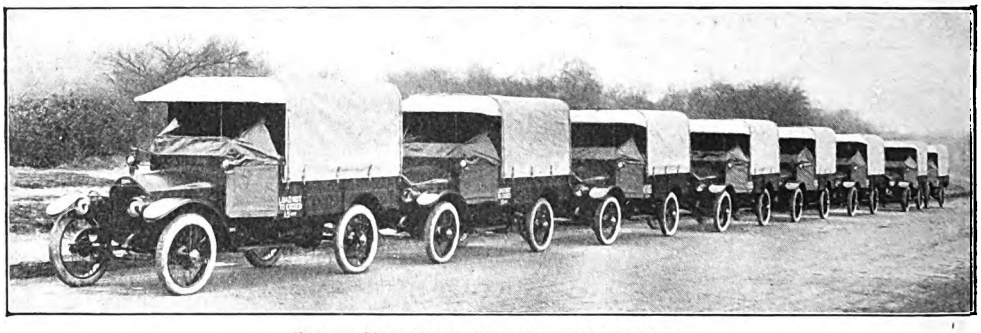
* * *

Mr. E. A. Scaife, Plymouth District Goods Manager, Great Western Railway, who retired at the end of the year, is succeeded by Mr. C. A. Patey, District Goods Manager for the Exeter district. Mr. W. H. Lucas follows Mr. Patey at Exeter.

———

Owing to the enormous growth of grain traffic in Canada, the Canadian Pacific Railway found it necessary to double-track its Winnipeg–Fort William line some years ago, so that now four lines of steel connect the prairie capital with the Lake Superior ports. A system has been built up under which from 1,500 to 2,000 cars can be absorbed without the semblance of hurry, which means that over two million bushels can be delivered daily at Fort William, unloaded through the terminal elevators, and discharged into the holds of waiting vessels, and at the same time each individual carload will be accurately checked and weighed, sampled and accounted for to the shipper, be he a small farmer on the prairie or a large corporation dealing in grain by the million bushels. In solving the many problems that have arisen during the growth, to its present proportions, of the grain trade of the Canadian West, the Canadian Pacific Railway Company has played no insignificant part. Owning and operating the first terminal elevators at the Lake ports, it was the pioneer in steel construction, and to-day operates the largest single elevator in the world, Elevator "D," with a capacity of 7,350,000 bushels under one roof, and has also set the example to the grain trade in equipping its houses with the most modern devices for cleaning, drying and treating damaged grain.

The following appointments in the Passenger Traffic Department of the Grand Trunk Railway are announced: Mr. W. S. Cookson to be General Passenger Agent, and Mr. C. W. Johnston to be Assistant General Passenger Agent. The positions of Assistant Passenger Traffic Manager and assistant to the Passenger Traffic Manager are abolished. Mr. H. S. Carmichael has been appointed passenger and freight manager to the Canadian Pacific Ocean Services, Limited. Mr. G. McL. Brown, the European manager of the Canadian Pacific Railway, announces that Mr. H. G. Dring is appointed General Passenger Agent for Great Britain and Europe in succession to Mr. H. S. Carmichael. Mr. W. P. Hinton, Assistant Passenger Traffic Manager of the Grand Trunk and Grand Trunk Pacific Railways, has been appointed Traffic Manager in charge of freight and passenger business for the Grand Trunk Pacific, with headquarters at Winnipeg, and Western Traffic Manager of the Canadian Government railways. Mr. W. D. Robb, Superintendent of Motive Power, announces that two of the annual fire brigade competitions for employés of the Grand Trunk System have been won this year by the men of the car shops at London, Ontario. Employés' fire brigades at the various main repair shops, round-house terminals and other large buildings have long been an institution on the Grand Trunk.



FLEET OF NAPIER AMMUNITION WAGONS.

* * *

Eighteen new locomotives have been brought into service on the Nigerian Railways. Of these 16 were main line engines, fitted with superheaters, the remainder being for shunting. Ten of the main line and two of the shunting engines were built in America, and are largely designed to American practice, adopting where possible the standard features on existing British types. Increased coal consumption is partly attributed to these American engines, which are designed and built with a large grate area, but they are reported upon favourably as working agents. It is remarked that all the new main line locomotives built for this railway during the past few years have been superheaters, and but for this coal consumption would have been considerably higher.

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THE principal addition made to the service on the Nigerian system, irrespective of war conditions, was the institution of a weekly express train from Iddo to Kano (712 miles) for the purpose of dealing expeditiously with the Kola nut traffic which has been growing to a very satisfactory extent. This train also provides a means of quick third-class transit for native traders. It returns weekly from Kano to Iddo with cattle and produce, and also third-class passengers.

* * *

SINCE the decision of the Government of the Commonwealth to send troops to assist in the war, the staff of the Victorian Railways have responded in an admirable manner to the call of the Empire, and so far 2,073 employés have enlisted for active service, and we regret to say that fifty-five of them have been killed in action or have died of wounds, etc. There are 16,725 employés within the prescribed age limits, so that the number of volunteers for active service represents 12·39 per cent. of the total number eligible, and we feel sure that a spirit of loyalty and patriotism will still continue to inspire the members of the staff to respond to the needs of the nation. All the employés who have joined the Expeditionary Forces have been granted leave of absence until the date of their discharge by the military authorities, and their rights have otherwise been conserved.

* * *

A GREAT engineering feat was accomplished on December 19th with the completion of the Rogers Pass tunnel on the main line of the Canadian Pacific Railway. A passage has been made east and west through the heart of Mount Macdonald. The ceremony of firing the connecting shot was performed in the presence of a number of prominent railway and business men and engineers two and a half miles from either exit of the tunnel and a distance of 6,000 feet below the surface. The tunnel when complete will be 26,400 feet long, with approaches an additional nine miles in length.

* * *

THE Grand Trunk Pacific Railway Company's steamships operating in the North Pacific coast waters covered over 80,000 miles during the season of 1915.

* * *

MR. P. HIGGINS, who has been appointed Superintendent of Railways in the Cameroons, West Africa, was a pupil with the Great Southern and Western Railway of Ireland from 1898 to 1901, and was then appointed Chief Draughtsman in the locomotive works of the Dublin and South Eastern Railway, holding this position until appointed Locomotive, Carriage and Wagon Superintendent of the Tralee and Dingle Railway. In 1903, Mr. Higgins went as Locomotive Superintendent of the Cyprus Government Railways, and remained there until last year, leaving to take up his new appointment in the Cameroons.

* * *

SERBIA has ordered from the American Locomotive Company fifteen 2–6–2 engines. Furthermore, America is benefiting from the war owing to the non-availability of German and French locomotive-building firms to carry out orders for neutral countries, as shown by the announcement that the American Locomotive Company are building twenty-four 4–8–0 compound locomotives for the Madrid, Zaragossa and Alicante Railway in Spain.

* * *

A RECENT "Record of Construction" issued by the Baldwin Works, dealing with locomotives built for export, includes several items of interest, and remarks are also made in reference to the rapid execution of orders to meet war requirements. Thus, in the case of a small 0–6–0 saddle tank engine for the French Government, it is stated that this is one of twenty which was completed in sixteen working days from the time the order was received. Then of 100 Pechot-type engines—described in the RAILWAY MAGAZINE for August, and already mentioned—these were ordered on February 1st and forty were shipped on March 31st, and the last engine completed on April 24th. These locomotives were built entirely to metric measurements, from drawings furnished by the French Government. There were also thirty 0–6–6–0 Mallet locomotives for the Archangel Railway, Russia. These were designed and completed between November 10th, 1914, when the order was received, and January 6th, 1915, when the last engine was ready for shipment. These Russian Mallet engines are for the 3 ft. 6 in. gauge—adapted for conversion if desired to metre gauge. Particulars are also given of small 0–4–0 tank engines supplied to the Putilow Works, Russia.

* * *

IT is stated that through the British Government 1,200 box cars have been ordered from the Canadian Car and Foundry Company for the Belgian State Railways. These cars are of usual Continental four-wheeled type, and, therefore, strange to Canadian manufacture.

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Railway Literature.

THE special Christmas number of the *South African Railways and Harbours Magazine* is a well-produced and highly interesting publication. Messages of congratulation from the Governor-General of South Africa and departmental administrators and from the Minister of Railways and Harbours and the General Manager are reproduced in English and Dutch. Other contents include a series of maps showing railway progress in South Africa in 1875, 1895, 1905 and 1915, and a remarkable series of "Pictures of the Past," setting forth South African railway life in days gone by, besides a large amount of general material.

* * *

ELECTRIFICATION ON THE NORFOLK AND WESTERN RAILWAY. [Published by *The Tramway and Railway World.* 24 pp. and cover 13½ in. by 9¾ in. with map, 7 drawings and 20 half-tone illustrations. Price 2s.] This booklet describes the conversion to electric traction of an extensive section of the Norfolk and Western Railway, to which short reference was made by "Indicator" in the November and December numbers of the RAILWAY MAGAZINE. This is the most important installation for goods service that has yet been carried out, and very heavy coal trains are now being hauled for a distance of 100 miles by powerful electric locomotives. The electric locomotives, which weigh 270 tons, are capable of developing 5,000 horse-power when hauling a train weighing 3,250 tons up a gradient of 1 in 100.

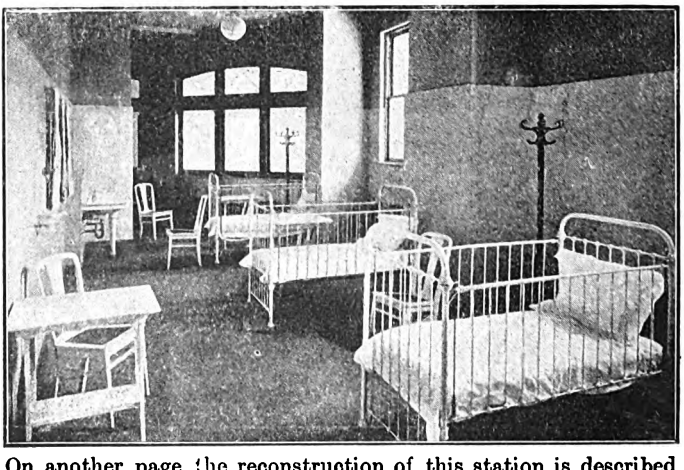
* * *

"WHICH SCHOOL SHALL IT BE?" The Great Northern Railway Publicity Department issue a new edition of their booklet under this title, described as a guide to boarding schools situated in the healthy and attractive districts served by the Great Northern Railway and its connections. The object of this small book is to render some assistance to parents and guardians in quest of a reliable school for a boy or girl. It is pointed out that the Great Northern Railway and its connections serve thousands of miles of territory where there are good schools, and the success attained by the majority of them testifies to their own merit and to that of the places in which they are situated. Copies can be had on application to the Superintendent of the Line, Great Northern Railway, Advertising Department, 3, York Road, King's Cross, London, N.

* * *

"SYREN AND SHIPPING ILLUSTRATED" provides in its New Year number the usual annual review article dealing with shipping and allied industries, and continues the elaborate highly artistic characteristics associated with all its special issues.

"THE NURSERY": WINDSOR STREET STATION, MONTREAL, CANADIAN PACIFIC RAILWAY.



On another page the reconstruction of this station is described and illustrations therein given may here be supplemented by a view of the "Nursery" mentioned in the article.

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THE RAILWAY MAGAZINE.

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Lewes Seaford Eastbourne Bexhill St. Leonards Hastings	Trains leave Victoria at 9.0, 11b15, 11.55 a.m., 1.25, 3.20, 5.20, 5c45 (not Sats.), 6.45, 9a5 p.m.; London Bridge 9.50 11.50 a.m., 1.15, 2.0, 4.5, 5.5, 7.0, 9a13 p.m. *a* Not to Seaford. *b* To Lewes, Seaford and Eastbourne only. *c* To Lewes and Eastbourne only.
Littlehampton Bognor Hayling Island Portsmouth Southsea Isle of Wight	Trains leave Victoria 10.20, 11.25 a.m., 1.42, 3c55, 4c53, 7H20c p.m.; London Bridge 10c25, 11.20 a.m., 1.50, 4c0, 4c50, 7H15c p.m. c Not to Isle of Wight. H Not to Hayling Island.

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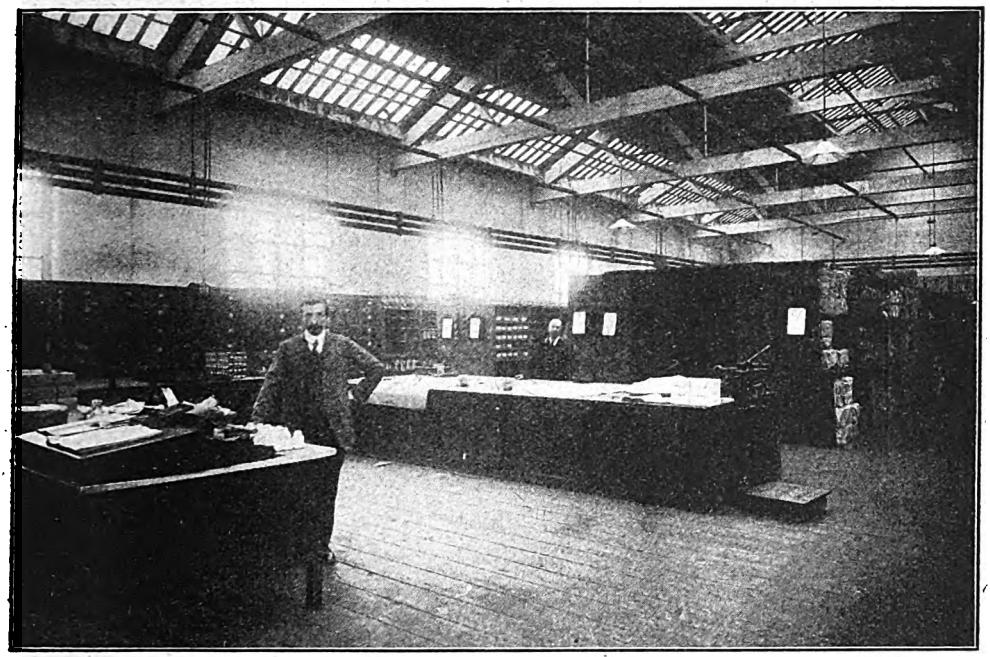

Photo] [*Topical.*

THE LARGE "A" WAREHOUSE AT GORTON.

The Stores Department of a Great Railway.

By J. F. GAIRNS.

"BY their works ye shall know them," may be said to be the motto of the chief operative departments of a large railway company, and the more their "material, machinery and methods" are brought under public notice as factors whereby the railway is enabled to conduct its traffic efficiently, advantageously and attractively to traveller and trader and with due regard to the economics of public transportation and the interests of the shareholders, the more highly are such departments esteemed. Thus, the visible evidences of the Chief Mechanical Engineer's department are the locomotives, passenger and goods vehicles, and other mechanical agencies which come within his province; the track, stations, bridges and other structures similarly advertise the Chief Engineer; train services and passenger and goods facilities show the capabilities of the traffic departments in respect of the obtaining and working of traffic; and other sections and sub-departments, such as the signal, electrical, restaurant, marine, etc., require to be more or less in evidence.

But in the case of the Stores Department unobtrusiveness is essential to efficiency; its activities are not paraded, and the less that is seen of its operations the higher is its standard. As many of the facilities of life are not realised until they are withdrawn, so the Stores Department is not conspicuous whilst it is able to meet all the various and numerous calls upon it. Its offices are frequently included in those of a more prominent department, and its warehouses are located with a view to convenience rather than display. Where it has workshops these are often hidden away in some corner of railway property and are generally more useful than ornamental. And the bulk of its traffic is conveyed by goods train or by means of Stores Vans operating on schedules

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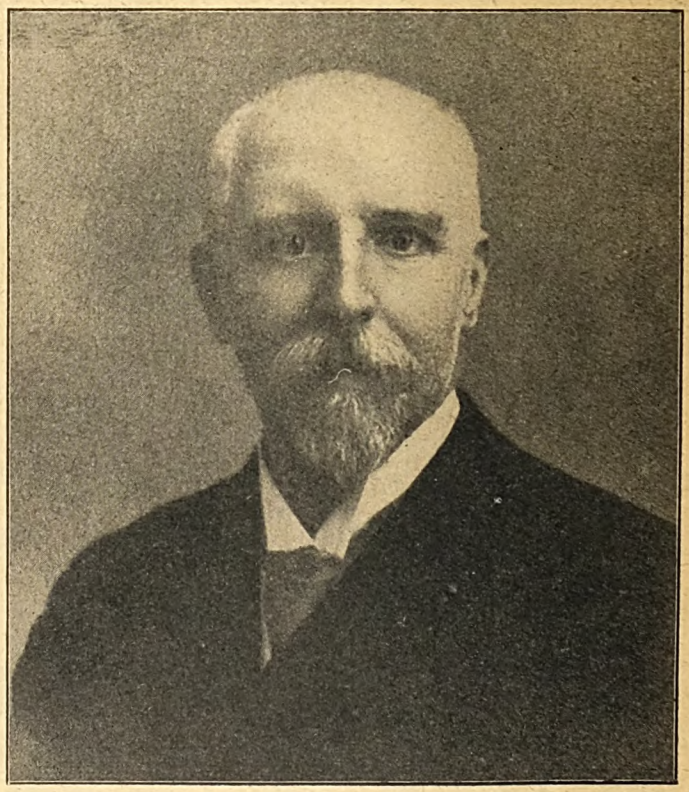

MR. WALTER WILLIAMS,
Stores Superintendent,
Great Central Railway.

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which are advertised only for staff purposes.

Yet where modern schemes of organisation are carried to their logical outcome it is generally found that the Stores Department ranks as the great purchasing agency of the company, its operations extend into almost every other department, and in large measure it is correct to claim that the operative efficiency of the railway as a whole is dependent upon the standard realised by the Stores Department.

There are, however, very few lines where the Stores Department is quite so highly organised. According to older systems each department had its own stores section, the various storekeepers being responsible for maintaining necessary stocks of all requirements, besides being the agencies through which purchases were made, the general management being under the chief departmental officer concerned, and the cost of "stores" being, of course, included in the range of expenditure covered by the departmental monetary allowances.

This worked fairly well for a long period, and in fact until the necessity arose for more closely supervising expenditure in order to maintain a proper ratio between total expenditure and revenue, notwithstanding the decided though undesirable tendency towards increased ratios which railway accounts have shown for a number of years past. It was not that the departmental stores were unfavourably operated, nor that the system itself conduced to extravagance. But there are so many items which are used by more than one department, and of which each required to maintain proper stocks, besides which the sectional system tends to hinder a correct impression of the economic aspects of railway supply and purchase. Consequently during recent years there has been a gradual trend in favour of centralisation of stores, departmental stores being organised in association with the main stores instead of being individually independent.

It is mainly in reference to articles and materials which may apply to more than one department that advantage is found, especially as the central principle avoids duplication and multiplication of similar stocks, while the reduction in the number of purchasing agencies may prevent "cross-purpose" action or unfavourable expenditure to a degree. But when adopted so far it is a natural corollary that such schemes should be extended to cover nearly the whole range of purchase and supply.

It is sometimes claimed that this principle could with advantage be carried still further, the whole system of purchase and supply being correlated through the Stores Department. Not only are odds-and-ends, such as soap, soda, pots and pans, brushes, paints, pins, nails, bolts and nuts, screws, rubber, and a thousand-and-one other articles thus supplied, but also machines, appliances, plant, equipment, stationery, fuel and so on. In addition it may logically be argued that complete locomotives and vehicles; sections of new, relaid or altered permanent way; signal installations; bridges, stations and other structures, and in fact all "cost" items other than salaries, wages and non-purchase payments, should pass through the records of the Stores Department. Under such a scheme all manufacturing work by departments, and all outside contract work would be done to the order of the Stores Superintendent, and then debited, together with other supplies and materials, to a using department or against a particular undertaking.

This is, perhaps, carrying the principle of a Stores Department rather too far, seeing that it becomes a somewhat unreasonable proposition to consider, say, every individual part of a new locomotive engine as manufactured to the order of the Stores Department, and then charged to the particular engine, which again is "purchased" by the Stores Superintendent and "sold" as a complete machine to the traffic side of the Locomotive Engineer's department. But when carried out with discretion the general scheme offers many advantages, and there is a decided tendency in modern practice to approximate very closely thereto.

As thus organised, it is quite practicable to consider that the using departments are supplied through the Stores Department with all material, all standard items, and all appliances and equipment which have to be purchased outside, the Stores Superintendent being responsible until they can be charged either to the department supplied or to a particular undertaking.

The method outlined is particularly suitable in the case of the numerous instances of work done by one department for another, as the Stores Department affords an appropriate intermediary, while seeing that it is rarely possible to indicate a clear distinction between "manufactured" and "purchased" supplies such a system is advantageous in many other instances.

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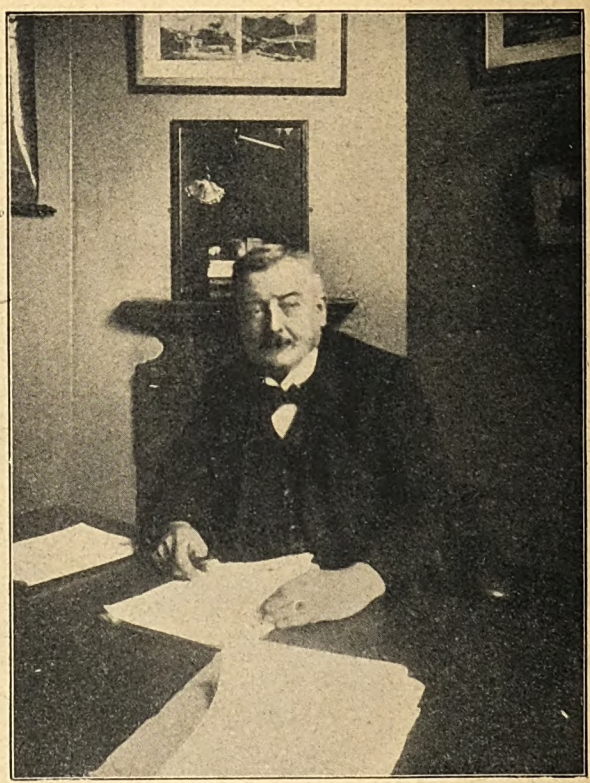
One of the most interesting instances of a close approximation to such a scheme is provided by the Stores Department of the Great Central Railway, "behind the scenes" of which the writer has been privileged to pass.

In this case the present scheme of organisation is largely due to the fact that the Chief Mechanical Engineer's department is extensively concerned with work done for other departments; that the Great Central Railway does not yet manufacture so widely as do certain other companies, though much more is now done than was the case until quite recent years; and the character of the system is particularly convenient for the centralisation of supply agencies. As now constituted, almost the whole of the Company's supplies pass through the Stores Department, or appear in their records, while in a few instances actual "manufacture"—including "assemblage" of purchased units into complete articles of a simple character, as will be seen—and reclamation or utilisation of more or less waste products are also undertaken. There are, of course, Chiefs of Sections specially competent for dealing with particular classes of work, and in large measure these gentlemen occupy positions very similar to those of departmental storekeepers. Indeed, some of them obtained their experience in such positions, and were transferred to the Stores Superintendent's staff for that reason.



Photo] [*Topical.*

MR. THOMAS ROTHWELL,
Chief Clerk.

Mr. Walter Williams has had the direction of the Stores Department since 1908. The whole of his railway career has been spent in the service of the Great Central Railway Company and its predecessor, the Manchester, Sheffield and Lincolnshire Railway. He commenced in January, 1874, in the Cashier's Department at Ardwick. In March, 1876, he was transferred to Worksop as a goods clerk, proceeding to Newton in October of the same year. In 1877 he was appointed a relief clerk, then under the control of the Accountant, and continued on the relieving staff until he became a travelling auditor in October, 1884. In 1903 Mr. Williams was appointed Chief Traffic Canvasser, and continued in that capacity until he was selected in 1907 for the position of Assistant Store-keeper. Nine months later Mr. Williams was appointed in charge of the Department. He is now known as Stores Superintendent, with headquarters at Gorton.

Mr. Williams shares offices with the Chief Mechanical Engineer, being located in the same block of buildings—illustrated in the RAILWAY MAGAZINE, November, 1914, when the writer described the Gorton Works, of which Mr. J. G. Robinson has charge. The distribution offices, Stores Department workshops, and various stores buildings are located on the works area at Gorton, and the plate store and general warehouse are included in the same blocks as certain departments of the "works" proper.

There are also premises at Chesterfield, now utilising a warehouse originally erected for the Lancashire, Derbyshire and East

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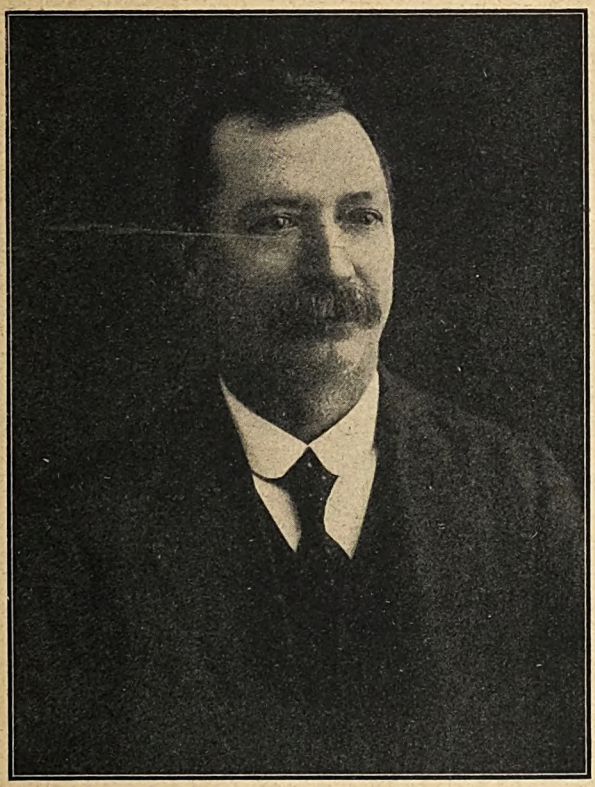
Coast Railway. This section is concerned mainly with traffic and electrical stores, being under the direction of Mr. Robert Richmond, who ranks as "Assistant Stores Superintendent." The permanent way stores are at Sheffield, so as to be convenient for the whole of the system; and in the Dukinfield workshops are the carriage and wagon stores. A depôt at Marylebone supplies the London area; while the marine and steamship supplies are dealt with at Grimsby. There are also numerous sub-depôts, placed at every place where one is justified. On a larger scale these are in charge of a Stores Department staff; in other instances under an official who is responsible to the Stores Superintendent for that part of his work only.

Apart from Mr. Richmond, Mr. Williams has five principal assistants, all attached to headquarters. Mr. Thomas Rothwell ranks as Chief Clerk, and is responsible for the clerical staff as a whole, though they may also be classified as attached to the staffs of the other chief assistants as regards the division of duties and subjects dealt with.



MR. G. TOMKINSON,
Distribution Section.

Mr. G. Tomkinson is concerned mainly with "Distribution," while the duties of the three remaining assistants are: Mr. E. J. Gass, Purchasing and General; Mr. Frederick Hoole, Engineering and Sales; Mr. R. M. Holland, Coal. The clerical and general staff at Gorton now numbers 49, including a number of women in replacement of men who have joined His Majesty's Forces. 185 workmen are employed in the department.

DISTRIBUTION SECTION.

The main warehouse occupies a position in the middle of the large block of buildings constituting the "New Locomotive Shops." On the ground floor, served by railway tracks, is a plate and iron store, fitted with a 3-ton travelling crane, electrically operated, while above is the general warehouse, with a lift capable of taking about 30 cwt connecting the two floors. The upper premises are so arranged that access entails passing the office, stocks being arranged in bays all leading from the central space under direct observation by Mr. E. Holland, who is in charge. Material for use in the works is served out at a counter on production of a demand note showing the particular heading of expenditure under which the material is to be charged.

The various bays are formed by wooden cases built up on an "adaptable unit" system, with sub-divisional trays for smaller items, the classification being partly according to general subjects, such as bolts, nuts and screws; gas lighting requisites, burners, shades, mantles, etc.; electric lighting requisites (for shop and yard use only—train and station requisites being dealt with at Chesterfield); rubber (this bay is covered over, as unshielded light tends to cause deterioration); miscellaneous tools (hammers, axes, spades, pick-axes, etc.); hardware, glass and crockery; stationery requisites (ink, paste, etc., but not stationery and printing); dormitory fittings, advertising signs, notices, badges; cushions, window straps; polishes, rat poison, mouse

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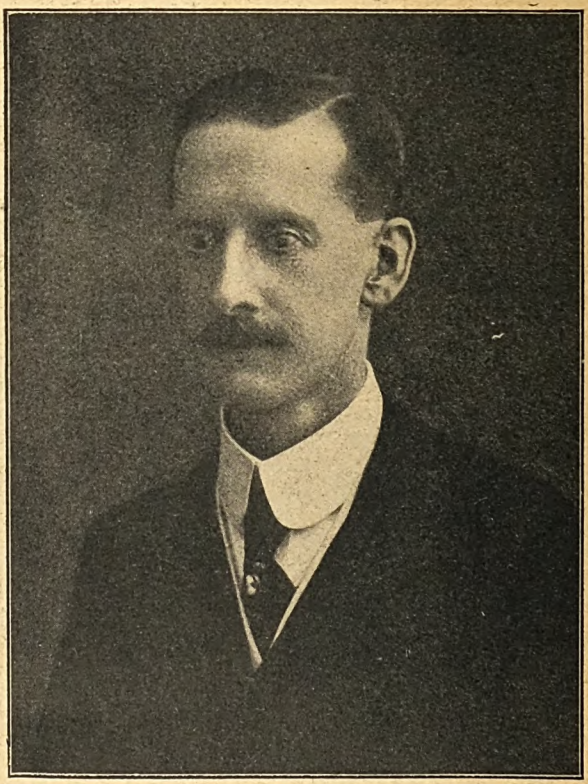
powder; crayons, decorations (including ornamental tops for masts erected at stations on gala occasions); etc., etc. There are also racks for belting, cabinets for ambulance supplies, and suitable accommodation for hundreds of other items, including various sizes of standard articles. The system of cases and trays allows of building up, extension and re-arrangement with a minimum of trouble. At present the number of classification places provided is 2,526, large or small, thus covering an exceptionally wide range, though the items above-mentioned afford only a very slight indication of their miscellaneous and comprehensive character.

The system of separate stock sheets for each commodity (introduced by the Stores Superintendent) is adopted, and shows the receipt and issue of all the commodities. By this means the actual stock on hand can be instantly ascertained, whilst the consumption of each class of material is also shown. Further, if confirmation of the actual stock is required, as is, of course, necessary at certain set periods, this is considerably facilitated by the unit and tray system referred to, as in the case of articles dealt with by weight the trays are weighed complete with their contents, and the weight of the trays deducted shows the actual net weight, whilst if numbers are required, the material is already stacked in such a way as to disclose at sight the actual number.

The plate stores below, and the iron store in another building adjacent, are principally concerned in supplying the works requirements. A lock-up building near by deals with the relatively valuable tubes used for superheater elements. There are also smaller stores associated with the various shops, the man in charge being on the Stores Superintendent's staff. A system is also in operation whereby copper and brass scrap materials are placed in lock-up bins, the scrap being handed over to the Stores Department daily as produced, where it is examined, sorted and classified.



MR. E. J. GASS,
Purchasing and General Section.

Material made in the works is manufactured to an order issued by the Stores Superintendent, and when completed is delivered into Stores with a cost note showing the value of materials and labour, which note is certified and then sent to the Accountant, the Stores Department being debited in the same manner as accounts from private contractors.

A range of small buildings opposite the warehouse provides for most of the "manufacturing" work conducted by the Stores Department itself. In one division coupling sticks for shunters are assembled, the hickory poles being tested as to strength, examined as to grain and quality, and fitted with the hooks, both elements being, however, purchased from outside firms.

Alongside, on an upper floor, is a boiling plant for recovering the fatty parts of axle grease taken from axle boxes, and below and adjacent are pans where suitable processes are carried out whereby the useful constituents thus recovered are prepared for and combined with new materials for

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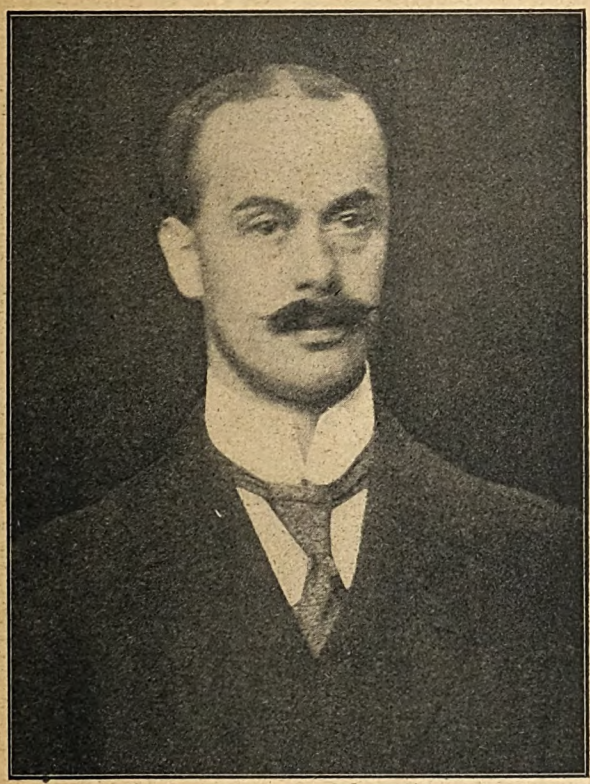
re-issue as wagon grease. It is understood that this plant was estimated to have repaid its original cost in less than a year's operation. In practice it is found that of a total annual consumption of about 500 tons of wagon grease, no less than 70 tons can be supplied from the recovery plant, which used axle oil, filtered, cleansed and admixed with new oil, to the extent of some 8 to 10 tons can now be depended upon. The cleansing and filtering is done by the Stores Department.

Adjacent to the distribution offices is a testing room where machines are installed for testing cordage, cloth and canvas, etc., including a vibration plant for testing incandescent gas mantles. Near by is a fog signal store, whence these useful and unfortunately indispensable articles are supplied, both of ordinary type and for use with Clayton fogging machines. Here the packets of detonators are placed in divisions, classified according to date as well as pattern, and arranged with a view to ensuring that all are used before the expiration of specified periods, this being an essential requirement to avoid the issue of "stale" and possibly untrustworthy material. There are also oil stores adjacent.



MR. R. M. HOLLAND,
Coal Section.

A number of experiments have been made from time to time with a view to rendering waste products of value, the grease and oil recovery plants referred to being examples of satisfactory results having been realised; and with the boiling "boshes" in the locomotive and carriage and wagon works, where motion and running parts taken out of engines and vehicles are boiled to obtain the grease and oil deposited thereon or remaining therein, have more than justified themselves.

Material for the subsidiary depôts are supplied from the main depôt at Gorton and distributed by means of Stores Vans, which are attached to passenger trains, whilst similar vans are also used for distributing the traffic stores sent out from Chesterfield. The use of these vans has reduced the number of articles going astray and breakages to a minimum. This section is supervised by Mr. Tomkinson, who can be practically called the Wholesale Dealer.

Purchasing Section.

This section is under the supervision of Mr. E. J. Gass, and as its title indicates, is concerned in the purchase of all materials used by the Company except stationery, hotel requirements, and Engineer's material. The latter requirements are dealt with in a separate section of the Stores Department, and receive attention later. A considerable number of charts are kept, showing the rise and fall of the prices for the various commodities in order that the Stores Superintendent may be able to go into the market at the most favourable opportunity, having regard to the probable requirements, the rate of consumption having to be carefully borne in mind, together with the trend of the market.

It is sometimes desirable to accumulate stocks of particular metals, especially copper,

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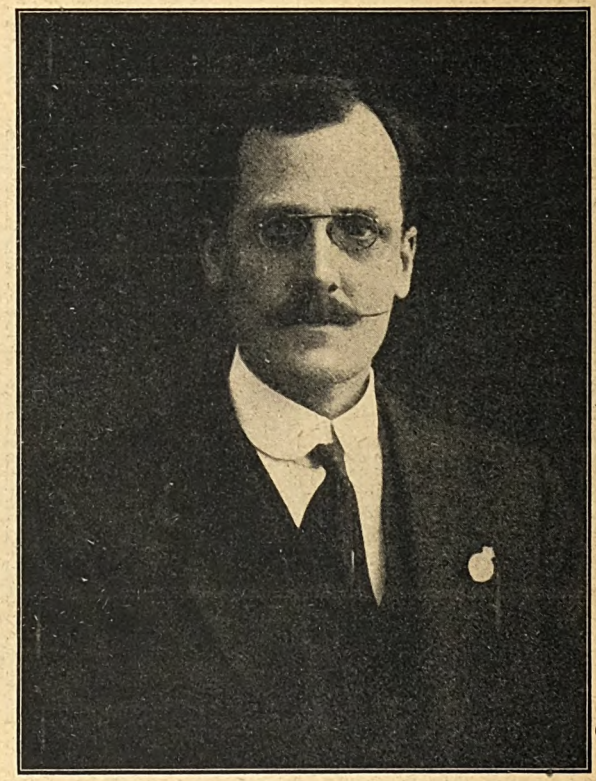
but otherwise the usual practice is only to provide for reasonable requirements ahead, with, of course, due regard to anticipated special demands.

The purchasing system is divided into two classes, viz., "Contract" and "Quotation," certain factors determining which class an article will be placed in. Articles which are of standard character, largely used, and which do not fluctuate in price, are obtained by entering into a contract for the Company's requirements for one year, but items which vary in price and for which there is not a constant call, are purchased "as and when required." In certain metals, the purchase is made when the market is favourable, reference being made to the charts before-mentioned which, together with the consumption or anticipated demands, enable a decision to be arrived at as to the quantity that can be reasonably purchased. Occasionally still lower prices might have been obtained by waiting a little longer, but as a rule extravagant rates are entirely avoided and the general average is very favourable.



MR. FREDERICK HOOLE,
Engineering and Sales Section.

For the "annual" contracts some 66 classified sections are scheduled, and advertisements are placed in the various trades journals and daily newspapers throughout the country, thus giving the greatest publicity to the fact that tenders are being invited. Tender forms are sent to firms wishing to tender for the particular class of goods in which they are interested, and samples of each class of goods are exhibited for eight days. These samples bear the official seal and future deliveries must be up to the standard set thereby or otherwise they are rejected on receipt.

The tenders are sent to the Secretary and are opened in the presence of the committee. After being tabulated by the Accountant, the Stores Committee, in conjunction with the various officers who are present to advise on technical points, and the Stores Superintendent, who supplies all information as to the manner in which the contractors have dealt with the company, and the quality of their goods, decide with whom the contract for the coming twelve months shall be placed. The official sample is sent with the first order to the successful firm for their guidance, a duplicate sample being retained for comparison with the goods delivered.

For material purchase "as and when required" the Stores Superintendent sends out quotation forms for various firms, the number varying according to the value of the order or the range of firms capable of supplying the commodity, and the order is placed with the firm offering the most favourable terms.

Coal Section.

Mr. R. M. Holland is the only one who may be considered a one-article man; but his subject—coal—covers the supply of some 1,000,000–1,200,000 tons of coal per annum, for the use of locomotives, stations, works and steamers. For this traffic some

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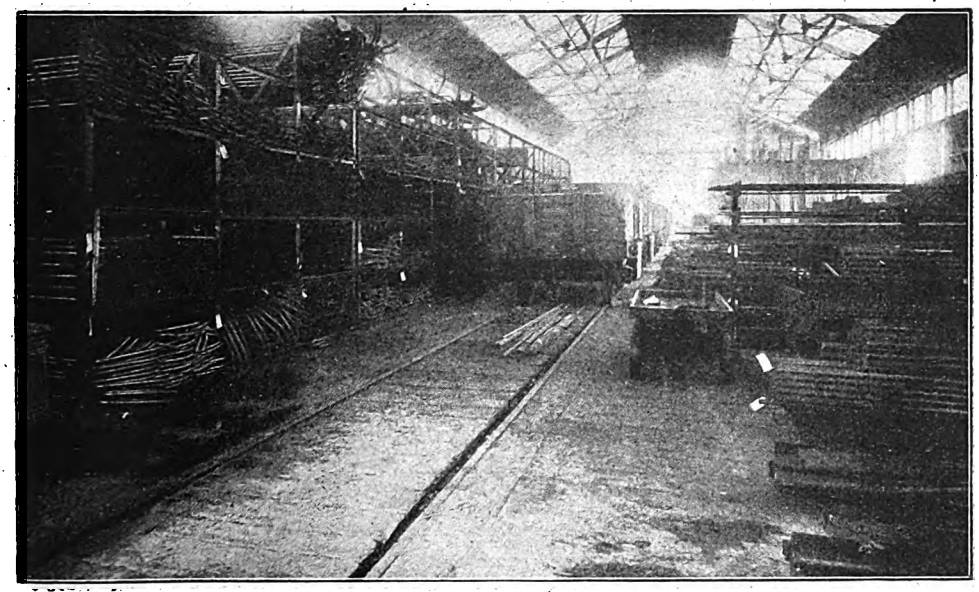
2,500 wagons are specially set apart, and their movement to and from the various collieries and depôts is controlled from the office at Gorton; this phase of distribution being rather a different matter from that supervised by Mr. Tomkinson.

On the Great Central Railway the General Manager has taken the matter of locomotive coal supplies and contracts, together with steel-rails, under his direct observation, and in the former case Mr. Holland, necessarily an expert on coal qualities and arrangements and contracts with the colliery firms and pit managers, operates largely, through Mr. Williams, with the General Manager's Chief Assistant, who also deals with this important matter.



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NEW IRON STORES.

The management of the locomotive coal supplies is one of special responsibilities, and necessitates a great deal of forethought, besides which it entails extensive use of the telephone and telegraph, and many special arrangements as particular conditions arise, seeing that it is impossible, and undesirable, for more than reserve stocks to be maintained on the company's premises, working stocks being largely ordered direct from the collieries with whom contracts are running, to the depôts being supplied.

Not only is it necessary to keep in touch with the fluctuations of coal prices, and advise as to the position of contracts, but the collieries must be kept up to the mark as regards quality and quantities called for, while the frequently varying depôt requirements have to be anticipated and the most satisfactory arrangements made for supply according to the locations of depôts and collieries and the extent to which the particular collieries have already been drawn upon in accordance with contract terms. This is further complicated by the varying demands for superior coal for express engines, and ordinary coal for goods and shunting engines, and the need for taking into account—particularly acute under present conditions—of the traffic conditions on the line, the delays incidental to fog, line congestion, and special traffic movements, such as those due to large-scale transportation to meet military or naval requirements, or, in normal times, such events as the "St. Leger" week, when Doncaster usually reverses the relative demands for main line and ordinary coal qualities, as well as increasing the amounts.

When conditions are substantially normal, traffic steady and of more or less definite character, and depôts can forecast their requirements fairly accurately, particularly if there are no disputes in the coal trade and collieries can be called upon virtually as desired, the coal supply system can be worked with ordinary care and capability. Charts and diagrams afford a good indication of the fluctuations of demands, and most

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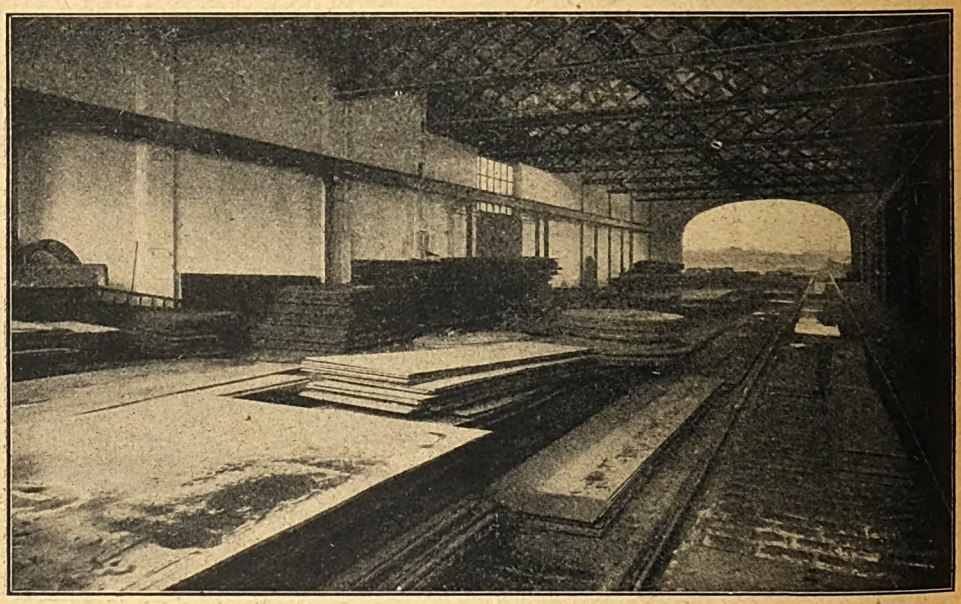
requisitions can be anticipated with approximate exactitude. This latter is a most important aspect, for in this respect, and indeed throughout most sections of the Stores Department, it is essential that demands should be anticipated, seeing that requisitions do not usually take sufficient account of all the factors included in the operations of the Stores Department.

But it is when such events as coal strikes occur, or when, as often happens now, naval or military traffic or fleet coal supplies entail unusual pressure upon certain locomotive depôts, that his knotty problems have to be solved, necessitating in many instances, special action to meet emergencies.

the supplies for the permanent way (rails, sleepers, chairs, fastenings, crossing timbers, etc.), signals, canals, etc., and general material used by artizans, masons, bricklayers, plumbers, gasfitters, etc.

Rails are not manufactured by the Great Central Railway, but are purchased from outside firms and are distributed by the Stores Department. Chairs are cast at Gorton, loaded at the foundry, and sent direct to place of user to localities west of Sheffield during the summer months, and to Sheffield permanent way stores in the winter, from whence they are distributed as required to places east of Sheffield.

Points and crossings are manufactured at Gorton to the instruction of the Stores



Photo] [*Topical.*

PLATE STORES.

On a smaller scale local "feasts" and "wakes" call for suitable provision, while breakdowns at pits, colliery holidays and the like may cause temporary stoppages of supplies which have to be allowed for. In addition, the coal section has to supply power stations with slack coal, and to maintain the steamer coaling supplies, besides attending to the workshop requirements.

Engineering Section.

This section, as its name implies, is concerned with the purchase and distribution of the requirements of the Chief Engineer, *i.e.*,

Superintendent, and likewise are sent direct to place of user with the exception that during the winter season, when, owing to weather conditions, the work of relaying is not proceeded with, a stock of standard sizes of points and crossings are accumulated at Sheffield in readiness for the next spring and summer activities. Sleepers and crossing timbers are purchased from importers who have specialised in this branch of trade, and are obtained ready creosoted and loaded into trucks, ready to be sent direct to destination, the selection of the timber being vested in the Docks Engineer of the Company.

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The geographical position of the Great Central Railway is favourable for rapidly obtaining supplies, with Sheffield and its rail manufactories as a pivot, and Grimsby and Immingham for imported timber. It is therefore not necessary for large stocks to be kept, and it has happened in several instances that rails rolled at the beginning of a week have been in the road on the following Sunday, the practice being in order to avoid the expense of storing and double handling to label direct from the makers' works to the spot where relaying, etc., is to be carried out.

With rails coming from Sheffield, chairs from Gorton, and sleepers from the east coast, it is necessary that the movements of the material should be closely governed to ensure the respective classes of material meeting on the ground in the proper sequence —sleepers, chairs and fastenings first, to enable the spiking on to be proceeded with, and finally the rails and points and crossings. To accomplish this a series of charts for the respective districts, or new works, are prepared and posted daily with the various deliveries of different classes of material. The Engineer furnishes an advance copy of the notice for the Permanent Way programme, and the Stores Department has thus a fortnight's notice to see that all the material is on the ground ready for the relaying gangs' operations.

The positions of the various contracts are recorded and recommendations made when to enter into new contracts, the markets are watched, and in the case of imported timber the necessity of entering into contracts in sufficient time to permit its importation before the Baltic freezes has to be regarded as a factor, and sufficient material of all classes has to be available for all the works to be pushed on energetically when the Engineer is able to take advantage of the longer days which herald in the spring.

At each of the depôts where the Engineer has divisional headquarters subsidiary stores are established which are fed from the Central establishment, and stocks are kept of glass, paint, varnish, drain pipes, spouting, gas fittings, boards, and requisites for all trades carried by the Engineer. At the Signal Works the Stores have their depôts, where the various signalling materials, rodding, spectacles, posts and iron work generally are ready at hand for use.

The Engineering Section is under the control of Mr. Frederick Hoole, who, prior to being transferred to the Stores Department in 1907, had 17 years' service in the Engineer's Head Office.

Photo] [*Topical.*

BOLT STORES: GREAT CENTRAL RAILWAY, GORTON.

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The work involved is, however, much more complicated than is suggested by the foregoing remarks. Not only have standard sleeper, rail, chair and other sizes to be supplied, but there are many special requirements to be considered. Thus in Woodhead tunnel special rails are laid, and on a viaduct crossing a reservoir near Leicester uncreosoted sleepers have to be employed as a legal requirement. And apart from such special cases, of which the system provides a number, no fewer than 38 lengths of rail are in use, there are over 600 patterns for ordinary and special chairs, and many sizes of bolts, treenails, spikes and keys to provide for various track lay-outs.

This is partly due to the fact that many old permanent way standards have still to be worked to, for as a rule, until a section of line can be entirely relaid, all renewals have to be made on the original basis, so that it may be from 20–30 years, or even more, before an earlier standard really becomes obsolete. Such variations apply not only to the rails and chairs, but also to the spikes and bolts required therefor, and in this respect Mr. Hoole often has to utilise his earlier experience in the Engineer's Department to the full.

This section is also concerned with other engineering supplies. Sometimes it has to supply standard items to a contractor who is building a new line, rebuilding a station or warehouse, or replacing a footbridge. Structional ironwork and the like, brickwork, masonry, glaziering and plumbing, signal materials, etc., all come within the same purview.

Sales Section.

This is a rather bigger source of revenue than is generally anticipated. On the Great Central Railway old materials and "scrap" usually bring in over £100,000 per annum. They comprise hundreds of different classes, ranging from the relatively valuable commodities of copper and brass, to old rubber, used barrels, old sleepers, rails, waste timber, gold leaf "skimmings" left after application to a carriage body by the collection of the portions extending beyond the border of a letter or numeral, and even the old broken gas mantles are considered valuable for the relatively rare earths and oxides used therefor. Residues from the grease and oil extracting plants also are disposed of, even old leather. The motto of this section may be taken as "waste nothing;" everything has a value—do not destroy, hand it over to the Stores, who will find a market.

The system in operation is for sales to be made of so many tons of certain commodities, which are open for inspection. The tenders for these are dealt with by the Directors in the same manner as new materials; but for a large number of articles the Stores Superintendent invites tenders and sells to the best advantage. Here again the market tendency has to be very closely watched and advantage taken of opportunity. In all instances the system is payment before delivery.

This little known but important branch of railway work is most interesting, the utilisation of waste being one of the wonders of recent times. New processes are constantly being discovered and the Stores Department are required to be alive to the best manner of disposing of the material it has to offer. The using department have to be induced to co-operate in collecting, sorting and classifying the material produced in order that the ultimate residue may be best placed on the market. This section is also under the control of Mr. Hoole.

Enough has been said to indicate the exceptionally wide scope of the Stores Department when organised as suggested, though there are hundreds of other considerations which cannot even be mentioned in an article such as this. Marine and Dock Engineering, Power Stations, Road Traffic equipment suggest other possibilities, and one might increase the list almost indefinitely.

The principle of centralising everything upon the Stores Department is thus carried out on the Great Central Railway very nearly to its logical outcome. Hotel and restaurant car supplies are not dealt with by that department; while stationery is also under separate control, but these may be considered to be "the exceptions which prove the rule." The General Manager's direct oversight of coal and steel rail contracts does not affect the main question, seeing that they are still dealt with by the Stores Department, and the personal attention to these two principal items by Sir Sam Fay is one of the special measures which might be anticipated, and which is, it is understood, paralleled on several others of the great railways. The general work of the Stores Department is of course, carried on under the supervision of the Stores Committee of the Board of Directors, to whom Mr. Williams is responsible, and he must therefore be perfectly familiar not only with railway

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requirements, but must, in addition, be in daily touch with all the markets, as there are very few articles of commerce which are not called for in the upkeep and working of a great railway. The problem he is called upon to solve is to meet all reasonable calls, urgent or emergency as well as standard, with promptitude, and yet at the same time keep the value of stocks to their lowest pitch, constantly having in mind that the amount of capital shown as stock "on hand" is not earning money.

By centralising all the departmental stores upon the main stores it becomes possible to avoid multiplications of similar stocks, as an emergency in one can always be met by transferring a surplus from another, a general reserve being sufficient for all normal requirements, in conjunction with reasonable provision for the future.

In reference to the work of the Stores Department, several little anecdotes told to the writer by officials at Gorton will be of interest.

One is to the effect that in the early days of code telegraphy, now a usual method, a simple code word being used to convey a comprehensive message or instruction, a station was telegraphed as to the number of wagons of coal on hand, the reply read :—"Gum (the code word for 'your telegram'), none on hand." This message arrived after the office had closed, but next morning the telegram was found endorsed by the Stores Porter on duty, to whom it had been delivered, "Sent a pint."

Another coal story. An advice as to certain wagons of coal at a station was not understood, the number of a wagon not agreeing with the record. The station-master was accordingly telegraphed asking "How is wagon lettered?" In this case the message was sent wrongly, "painted" being substituted for "lettered," and elicited as answer, "Slate colour."

MR. R. RICHMOND,
Assistant Stores Superintendent.

In the old days parcels for the Stores Department were left at Gorton station and brought into the depôt by a porter at convenience. In connection with this system a record book was kept, and checked at the end of the week. One of the entries required the insertion of the name of the place whence a parcel had come, and the stores clerks were much surprised on one occasion when an entry in this column, presumably relating to a packet not fully indicated, included the words "No 'come from.'"

In conclusion, the writer would express his indebtedness to Mr. Walter Williams and to his principal assistants at Gorton, Mr. F. Hoole in particular, for the courteous co-operation in reference to the preparation of his article and the collection of information therefor; also to other Great Central officers concerned in making the necessary arrangements.

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British Railway Service and the War. [II.]

WAR conditions have introduced many side issues in regard to the services rendered by railway men; and some of these aspects are ably summarised in the course of a short article published by our South Western contemporary. The title of "Protective Work at Waterloo" is adopted, and is appropriate to the wide range of subject matter covered. A few extracts may be given:—

"At an inquest held on the body of a woman who met with a fatal accident at Waterloo station while seeing her soldier son off by train recently, the coroner informally stated that he had noticed personally, since the commencement of the war, how ably the staff dealt with the large crowds which congregated there." It is pointed out by the writer that "such remarks are greatly appreciated, and well deserved, by those concerned, and form a welcome contrast to the petty complaints of a small section of the travelling public who give no thought to anything but their own personal convenience and comfort. They fail to realise that their own petty affairs must give way to military needs, and might well take to heart many a useful lesson to be learnt at any one of the great London railway termini.

"The great feature of a crowd at Waterloo station is the soldiers, and no one is more ready or eager to help them than are the station staff. Directions and advice are readily given, and instead of the 'cock o' the thumb' and an 'over there' that one used to hear about, the soldier is given full directions. Good work in this manner is being daily performed by members of the City of London Volunteer Training Corps, who cheerfully give up a few of their business hours to come to Waterloo and offer their help."

"Many of the troops who arrive on leave from France have considerable sums of money, and some of them would easily fall an easy prey to the harpies who would rob a soldier or the dead with as little compunction as they would kill an obnoxious insect. Thanks to the V.T.C., their 'trade' has greatly decreased, for the Volunteer escorts the unsophisticated Tommy across London to see him safely farther on his journey, or to help him in some other substantial manner."

"The Lord Mayor of London is greatly interested in this work, and on December 10th he visited Waterloo and paid close attention to the way in which it was carried out, and his observations must have convinced him that the railway and military police worked hand-in-hand with the members of the Corps which he assisted to promote."

"It is when a demand is made upon his inexhaustible fund of sympathy that the railwayman seems to come promptly to the front. After the departure of a troop train, tears are furtively wiped away, but sometimes the tears cannot be restrained, and a troubled mind is often comforted by a touch and a 'Never mind, mother; he will soon be back,' from a porter who himself is wondering whether his own boy is still living or has added another name to the Roll of Honour. Instances such as these are of daily occurrence, and the habitual grumbler must expect to receive brief answers when there are many with greater demands upon a railwayman's services."

We join with our Great Western Railway friends in congratulating Corpl. S. W. Lingard, of the 1/1st South Midland Brigade R.F.A., T.F., formerly a member of the staff of the Divisional Superintendent at Bristol, and a son of Mr. W. R. Lingard, the Great Western Railway District Cashier at Bristol, upon his being awarded the Distinguished Conduct Medal.

Sergt. P. H. Forbes, formerly of the Chief Accountant's Office, Paddington, now serving with the Royal Engineers Railway Transport Establishment (Military Forwarding Section) at the General Headquarters, has had the honour of being mentioned in dispatches for meritorious services.

Major S. G. Partridge, a son of Passenger Guard A. G. Partridge, Paddington, holds the important position of Director of the Stationery Department at the General Headquarters in France. Before the War he was employed in the War Office, which he entered in 1900. He volunteered for

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2ND LIEUT. CHARLES TRAVIS.
Great Central Railway.

active service and was placed in charge of the Base Stationery Depôt, his rank being that of Captain. In December, 1914, he was promoted to Assistant Director of the Department, and on April 10th last, raised to the rank of Major. He received further promotion to his present position in November. Since that date he has had the distinction of being mentioned in dispatches. Major Partridge's organisation comprises twenty-four officers and some 260 men, dealing daily with a hundred different branches of the Stationery Department.

The following additions to the list of commissioned officers from the Great Western Railway service may be noted:—2nd Lieut. W. T. Grainger, 3/4th Wiltshire Regt. (Locomotive and Carriage Department, Swindon); Lieut. F. R. E. Davis, Royal Naval Volunteer Reserve (Secretary's Office, Paddington); 2nd Lieut. E. T. Brown, 11th Service Batt., Gloucestershire Regt. (Engineer's Office, Chipping Sodbury); Lieut. C. F. Faith, Army Ordnance Corps (Stores Department, Swindon); Lieut. J. V. B. Wood, 12th South Wales Borderers (District Goods Manager's Office, Birmingham); 2nd Lieut. T. H. Turner, 3/23rd London Regt. (Locomotive, Carriage and Wagon Department, Superintendent's Office, Swindon); Lieut. G. V. Ducat, 8th Middlesex Regt. (Audit Office, Paddington); 2nd Lieut. J. E. Bottomley, 3/4th Wilts. Regt., T.F. (Locomotive and Carriage Department, Swindon); 2nd Lieut. E. J. B. Harris, 9th Batt. (the Queen's) Royal West Surrey Regt. (Office of Superintendent of the Line, Paddington); 2nd Lieut. E. H. R. Nicholls, Royal Welsh Fusiliers (Divisional Superintendent's Office, Paddington); 2nd Lieut. F. W. Creswell, Royal Flying Corps (Engineer's Office, Paddington); 2nd Lieut. C. F. Shardlow, 18th Royal Welsh Fusiliers (Chief Goods Manager's Office, Rates Section).

The Great Western Railway Company of Royal Engineers have now gone on active service abroad. During their train journeys through England the men were partakers of free refreshments such as are distributed at many stations, and these were greatly appreciated. At one place in particular the men arrived at 2 a.m. after entraining the previous evening in the rain with wet overcoats and boots, so that hot coffee and sandwiches, presented with the compliments of the Mayoress of the city, were highly appreciated.

Of the thirty or more members of the Great Central Railway higher grade staff, eighteen men—or, approximately, 50 per cent. of the staff—are now serving in His Majesty's Forces. Commissions have been granted to fourteen of the men, whilst four are serving in the ranks. A recent addition is the commission granted to Mr. Charles Travis, assistant goods agent at Marylebone. He "joined up" on November 20th, and was gazetted to the Army Ordnance Department as Lieutenant, being stationed for the present at the Royal Dockyard, Woolwich. Mr. Travis is well known by the books of which he is the joint author, *viz.*, "Station Management and Working," "Elements of Railway

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Operating Economics," and "Practical Railway Working," which have achieved wide popularity at home and abroad.

Among the officers mentioned in Sir John French's despatch of November 30th was the name of Temporary-Col. G. E. Holland, R.E., C.I.E., D.S.O., better known as Commander Holland, Marine Superintendent, London and North Western Railway. According to a Supplement to the *London Gazette*, Col. Holland is included in the list of promotions for services rendered in connection with military operations in the field, he being made a C.M.G.

We regret to hear of the death of Rifleman Lewis Blanden, son of Capt. Blanden, the popular Station Superintendent at Marylebone Station, Great Central Railway. A member of the Queen Victoria Rifles, Lewis Blanden volunteered for service immediately the war broke out. After some months of strenuous training, he went to France in November, 1914, and was severely wounded on the 31st December, 1914. After a long period in hospital, and light duties at the base, he was once more in the trenches.

Capt. Lindsey-Renton, writing to his father, Capt. Blanden, says:

"It is with the deepest regret that I have to inform you of the death of your son, Rifleman L. Blanden, 19th December. Your son was one of a party sent out to bomb the German trenches; in the course of this enterprise your son was killed either by machine gun fire or by a grenade, it is believed the latter. He was inside the German entanglement at the time of his death, and the party being hard pressed was, I regret to say, unable to recover his body. I have but little doubt but that the enemy got his body in, and I trust will give him a proper burial. Your son's death is a great loss to the Company, as he was one of the ever decreasing few who have been out here since the battalion first landed."

In civil life, Lewis was a draughtsman in the Chief Engineer's Office of the Great Central Railway, and his is the first loss the office has had.

MR. P. HIGGINS.

Superintendent of Railways in the Cameroons.

Last month we referred to the appointment of Mr. P. Higgins to be Superintendent of Railways in the Cameroons, West Africa, and we now have pleasure in reproducing his portrait. Mr. Higgins was a pupil with the Great Southern and Western Railway of Ireland from 1898 to 1901, and was then appointed Chief Draughtsman in the locomotive works of the Dublin and South Eastern Railway, holding this position until appointed Locomotive, Carriage and Wagon Superintendent of the Tralee and Dingle Railway. In 1903, Mr. Higgins went as Locomotive Superintendent of the Cyprus Government Railways, and remained there until leaving to take up his new appointment in the Cameroons.

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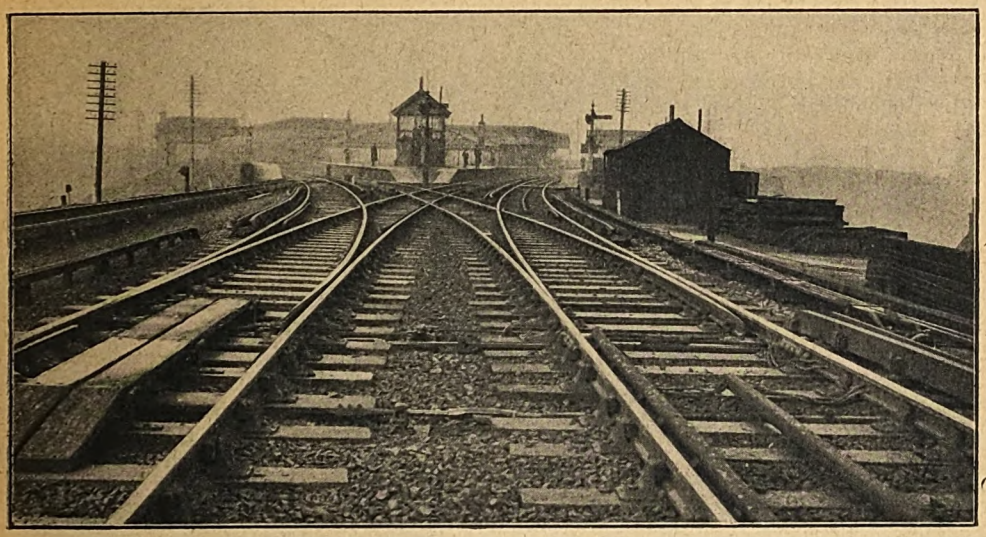

VIEW OF TRACK SHOWING THIRD-RAIL LAY-OUT AT RADCLIFFE EAST JUNCTION.

The First Electric Railway in Manchester.

WITH the completion of equipment of the Manchester-Bury route of the Lancashire and Yorkshire Railway, "Cottonopolis" obtains its first experience of local railway traffic operated electrically, and we have pleasure in publishing a full and authoritative description of this important undertaking. Improvements made from time to time by the Lancashire and Yorkshire Railway in the work of conveying passengers quickly and comfortably have been most marked during recent years, and a further important advance is the introduction of electric trains on the line which runs from Manchester to Bury through the favourite residential suburbs of Heaton Park and Prestwich.

Electric train working was first adopted by the Lancashire and Yorkshire Railway when the section between Liverpool and Southport was electrified in 1904, and the highly satisfactory results obtained have decided the Company in favour of similar arrangements on what is familiarly known as the "Prestwich Branch."

This is the first electric passenger-carrying railway in Manchester, and the inauguration of such a service marks an important stage in the economic development of the city and the evolution of means of rapid transit between the city and its suburbs. Experience has proved that electrification of suburban railways encourages the growth of traffic, and it has the additional advantage of enlarging the terminal capacity of stations. The Manchester district equipment has the further advantage in that the engineers responsible have the benefit of practically twelve years' experience gained elsewhere.

The growing importance of North Manchester as a healthy residential district and the ever-increasing number of people who are making their homes there, induces the belief that the new undertaking will be as conspicuously successful as its forerunner, which now affords means of rapid transit for thousands of people between their homes on the Southport line and the City of Liverpool where they have the fastest suburban service in the world.

Great as have been the improvements for reaching the inner suburbs of Manchester in recent years, the need for improved travelling facilities to the outer suburbs has not yet

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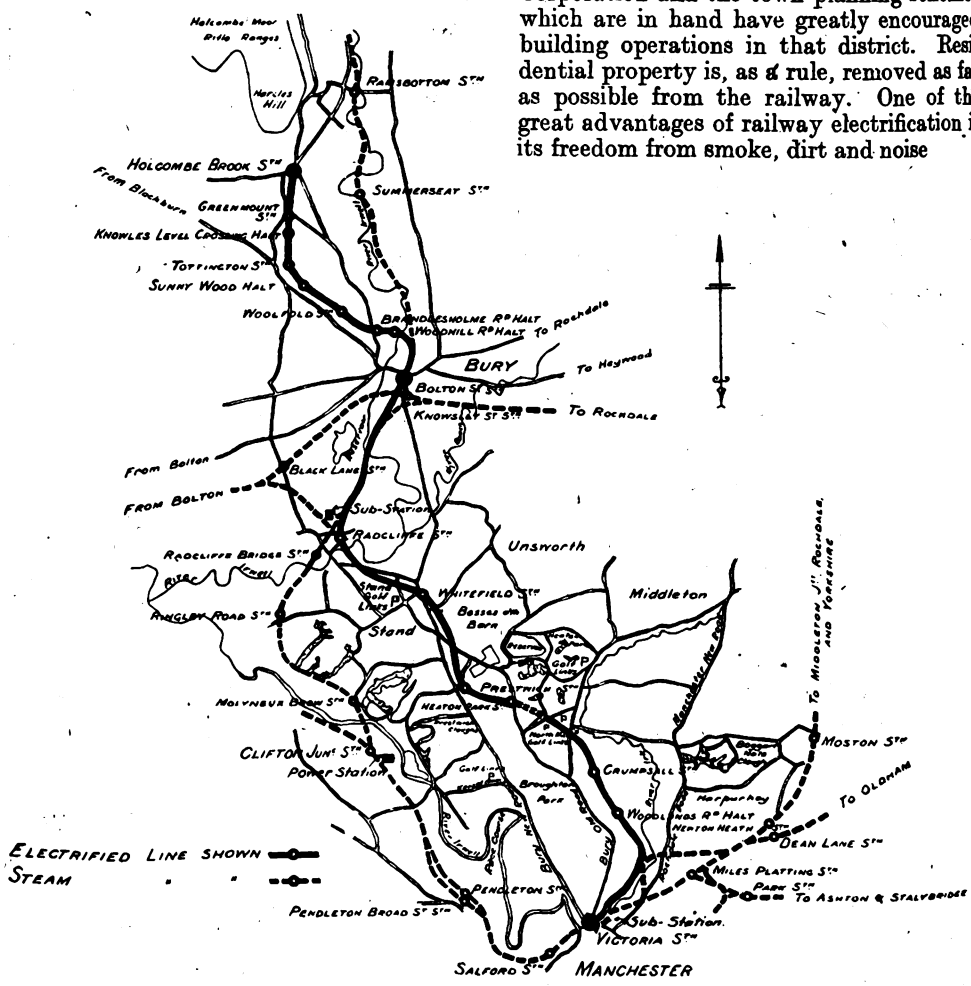
been fully met. Generally speaking, the city worker is compelled to live within a radius of three miles of his business owing to the lack of quick means of transit. Time occupied in travelling is often the measure of the distance at which he can live from the city. When the full service of electric trains is established on the North Manchester suburban line, the area conveniently available will, in effect, be considerably enlarged, and the various districts proportionately nearer to the central business area of the city. Prestwich, for example, will be five minutes nearer to the Manchester Town Hall than by the quickest service in operation under steam conditions.

The district to be served by the new electrification scheme, standing as it does at an average height of 300 ft. above sea level, is becoming increasingly popular as a residential one. During the past thirteen years the population of North Manchester and Prestwich has increased over 30 per cent., and the prospects are that the growth will continue at an even greater rate. The purchase of Heaton Park by the Manchester Corporation and the town planning schemes which are in hand have greatly encouraged building operations in that district. Residential property is, as a rule, removed as far as possible from the railway. One of the great advantages of railway electrification is its freedom from smoke, dirt and noise



MAP SHOWING ELECTRIFIED LINES AND INDICATING POSITION OF POWER AND SUB-STATIONS.

The work of electrifying the line was commenced before the outbreak of war, and as the necessity was felt for a rapid and efficient train service, it was decided that the work should be completed at the earliest possible moment. Conversion from steam haulage to electric traction had necessarily to be carried on under difficulties, but the management throughout determined that nothing should be done to interfere with the

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service of steam trains, and at no period during the progress of the work have the train services been interfered with.

In consequence of the war the full service of electric trains will not be put into force immediately. It is proposed to substitute certain of the existing steam trains by electric trains, and augment the service from time to time. The electric trains reduce the time occupied on the journey between Manchester and Radcliffe and Bury by 25 per cent.

A comparison of the time occupied on the journey is given below :—

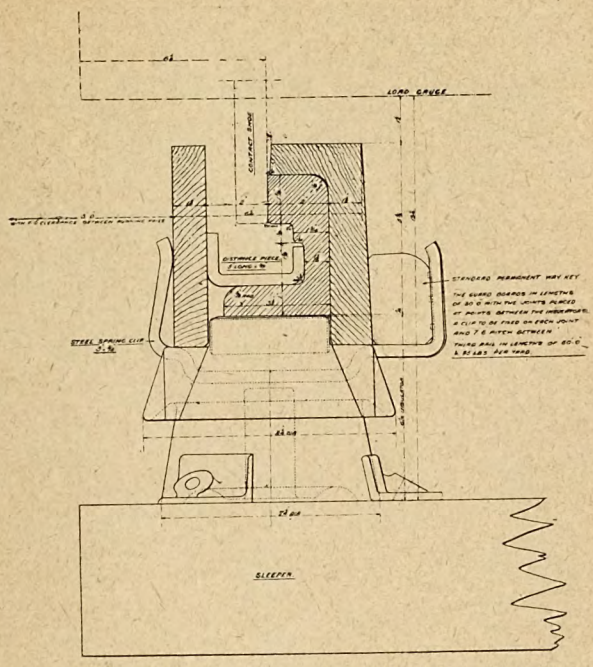
From Manchester to	Steam. Mins.	Electric. Mins.
Woodlands Rd. Halt	7	5
Crumpsall	10	7
Heaton Park	14	10
Prestwich	18	13
Whitefield	22	16
Radcliffe	26	20
Bury	32	24

From Bury to	Steam. Mins.	Electric. Mins.
Radcliffe	5	4
Whitefield	10	7
Prestwich	14	10
Heaton Park	17	13
Crumpsall	21	16
Woodlands Road Halt	24	18
Manchester	29	22

While referring to the characteristics of the districts which will benefit most from these new facilities, it will be interesting to mention the rates, water rents, and price of gas in the northern suburbs of Manchester. The following particulars give an approximate idea of these payments for a house of £25 rental per annum in 1915, as well as the daily cost of 1st and 3rd class annual season tickets :—

	Daily Cost of Season Tickets. 1st.	3rd.	Rates & Water Rents per annum. £ s. d.	Gas per 1000 c.f. nett. s. d.
Woodlands Rd. Halt	2¼d.	1½d.	10 10 3	2 6
Crumpsall	3d.	1¾d.		
Heaton Park	4d.	2½d.	8 11 9	3 2
Prestwich	4¼d.	2¾d.	8 11 9	3 2
Whitefield	5d.	3¼d.	11 10 2	3 2

The Power Station has been built at Clifton Junction, 4¾ miles from Manchester, on the main line to Bolton, the site possessing exceptional qualities for such a purpose. It is centrally situated with regard to the Lancashire section of the Lancashire and Yorkshire Railway; it is also adjacent to extensive coalfields, and there is a supply of water from the Manchester, Bury and Bolton Canal, which is owned by the Railway Company.



ARRANGEMENT OF CONDUCTOR RAIL AND GUARDS THEREFOR.

At the site selected the main line of railway is carried on an embankment, and as the power station is at a level 37 ft. lower, coal wagons can be run direct to the coal bunkers above the boilers. For the purpose of handling material between the two levels a 50-ton electric overhead travelling crane has been installed. The boiler room is 110 ft. long and 90 ft. wide, and a turbine room 188 ft. long and 64 ft. wide runs parallel to the boiler room. A 50-ton electric overhead travelling crane has been provided in the turbine room, running the full length of the building.

Three Babcock & Wilcox water tube boilers are installed, each having a normal evaporation of 32,000 lbs. of water per hour. Steam pressure is 200 lbs. per sq. in., superheated to a total temperature of 650° Fahr. The boilers are fitted with mechanical stokers and provided with separate economisers carried on a special floor above the boilers. One chimney and induced draft

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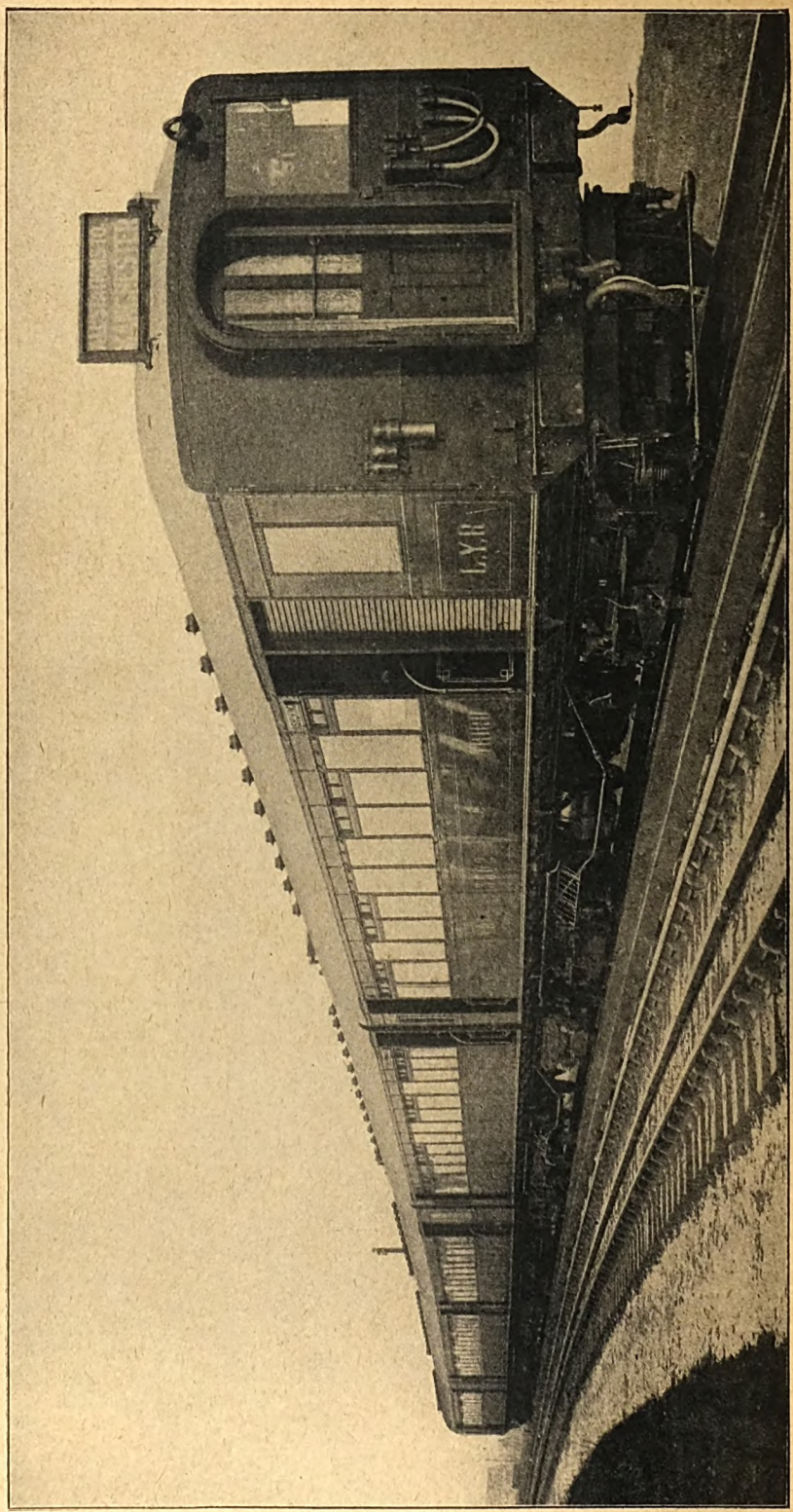

FIVE-COACH ALL-METAL ELECTRIC TRAIN INTRODUCED BY THE LANCASHIRE AND YORKSHIRE RAILWAY FOR THE MANCHESTER-RADCLIFFE AND BURY SERVICE.

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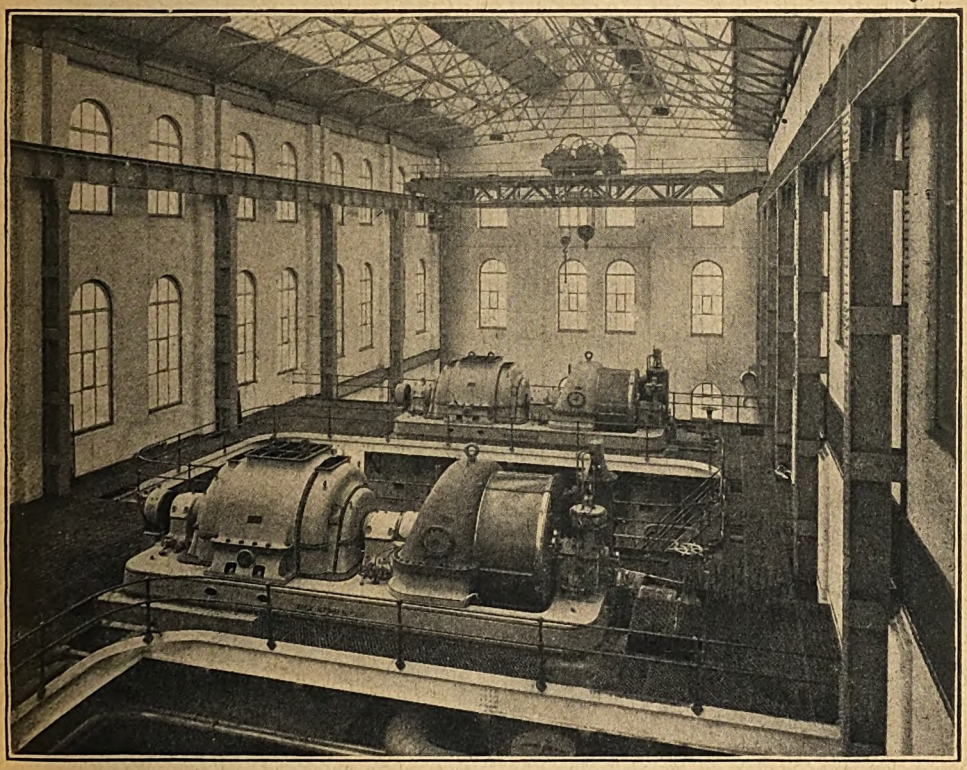
fan, common to two boilers, are provided on this floor. The chimneys, two in number, are of steel, with cast-iron ornamental tops. They are brick-lined, and measure 6 ft. inside diameter and 87 ft. high from the firing floor level. A large steel coal bunker, having a capacity of 50 tons, is provided above each boiler, the coal being conveyed by rail in steel hopper wagons which run over the bunkers. These wagons are self-emptying, so that labour in coal handling is reduced to a minimum.

Ashes from the boilers are automatically fed into ash hoppers underneath each boiler, and are then dealt with by means of a suction ash handling plant provided by Messrs. Babcock & Wilcox, Ltd. For this purpose a large receiver is installed outside the boiler house above the coal roads. A large exhauster is coupled up to the top of this receiver, and a cast-iron pipe for the conveyance of ashes, etc., is carried from the receiver down into the boiler room and underneath the ash hoppers. Special hoppers are also provided underneath each economiser and coupled up to the ash receiver in a similar manner to the above. By this means, both the ashes and soot are conveyed automatically when required into the large receiver, from which they are periodically emptied into wagons at the rail level.

For present purposes, in the equipment of the Power Station, two main generator sets are installed; these turbo-alternators are of the "Dick-Kerr" direct coupled type, each having a normal capacity of 5,000 k.w. In connection with each set, a large surface condenser of ample dimensions, manufactured by Messrs. W. H. Allen, Son & Co., Bedford, is installed. Three-phase alternating current is generated at 6,600 volts, 25 cycles.



GENERATOR ROOM IN POWER STATION.

In addition, one 500 k.w. gear-driven turbo-alternator, together with surface condensing plant, supplied by the British Westinghouse Co., Ltd., is installed. This set generates three-phase alternating current, at 440 volts, 25 cycles, and serves the auxiliary plant throughout the station, also for lighting and power at goods yards in the district, after the main generator sets are shut down at night.

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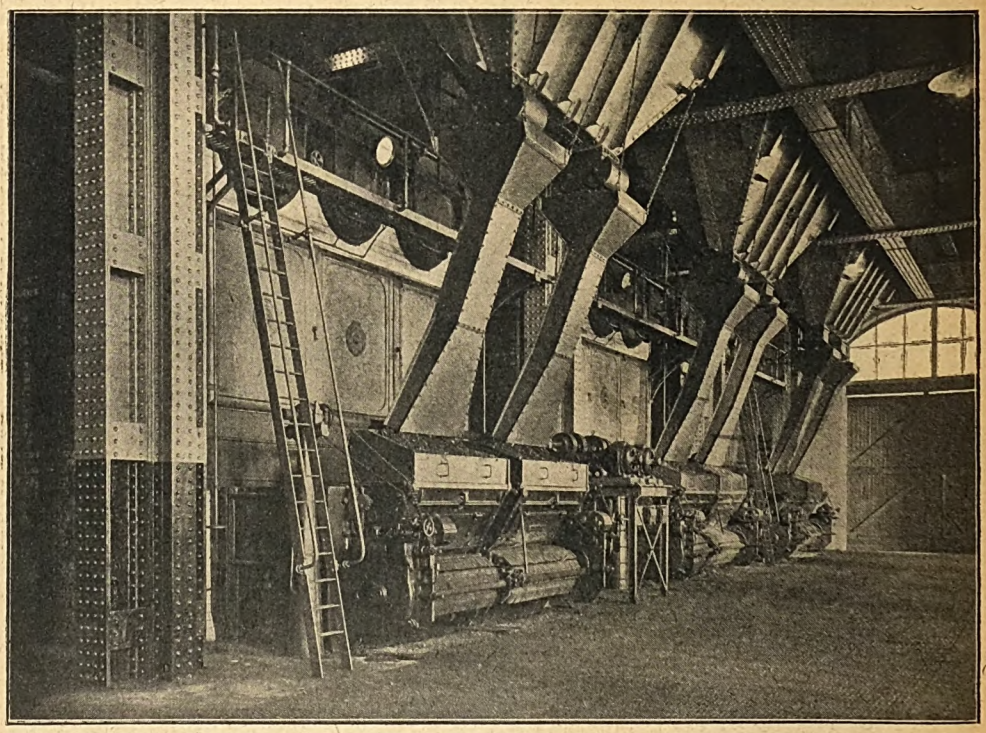
A suite of offices for the operating staff is arranged at one end of the turbine room, the top floor of which is used for the main switchboards. A separate building is provided outside the turbine room for the reception of the high tension switch-gear, which is electrically controlled from the turbine room, thus safeguarding the switchboard attendant from high tension current and facilitating manipulation of the main switches.

The switch-gear has been supplied by the British Thomson-Houston Co., Ltd., of Rugby, its special features being the cellular constructions of the high tension portion in concrete, and the protective interlocking for ensuring the safety of all concerned; and the electrical remote control. A small battery is installed in the lower portion of the switch-house, so that in case of a complete shut-down of the Power Station, current will be available for the operation of the main switch-gear, lighting the station, and working the two overhead cranes.

In conjunction with the canal, a cooling pond 408 ft. long and 109 ft. wide has been provided. Spray nozzles and pipes are arranged over the full area of the pond for cooling purposes, and coupled up with two centrifugal pumps in the turbine room. The main water supply from the cooling pond to the condensers is conveyed by a 45 in. diameter pipe line. The discharge pipes from the condensers are led direct into a special channel, parallel to the canal, with outlets at convenient points. The whole of the circulating water pipes have been manufactured by Messrs. J. Clayton, Son & Co., Leeds.

For transmission purposes, high tension alternating current is distributed in that form, but for supplying to the live rail at the required voltage, two sub-stations have been equipped, one at Radcliffe and the other at Manchester (Victoria Station). Each sub-station contains three rotary converters, each of 1,000 k.w., together with transformers, whereby direct current is supplied to the live rail at 1,200 volts. A large battery is installed at each sub-station for reducing peak loads on the Power Station, and in case of emergency provides sufficient capacity to enable all trains to reach their respective destinations without inconvenience to the travelling public.



BOILER ROOM IN POWER STATION.

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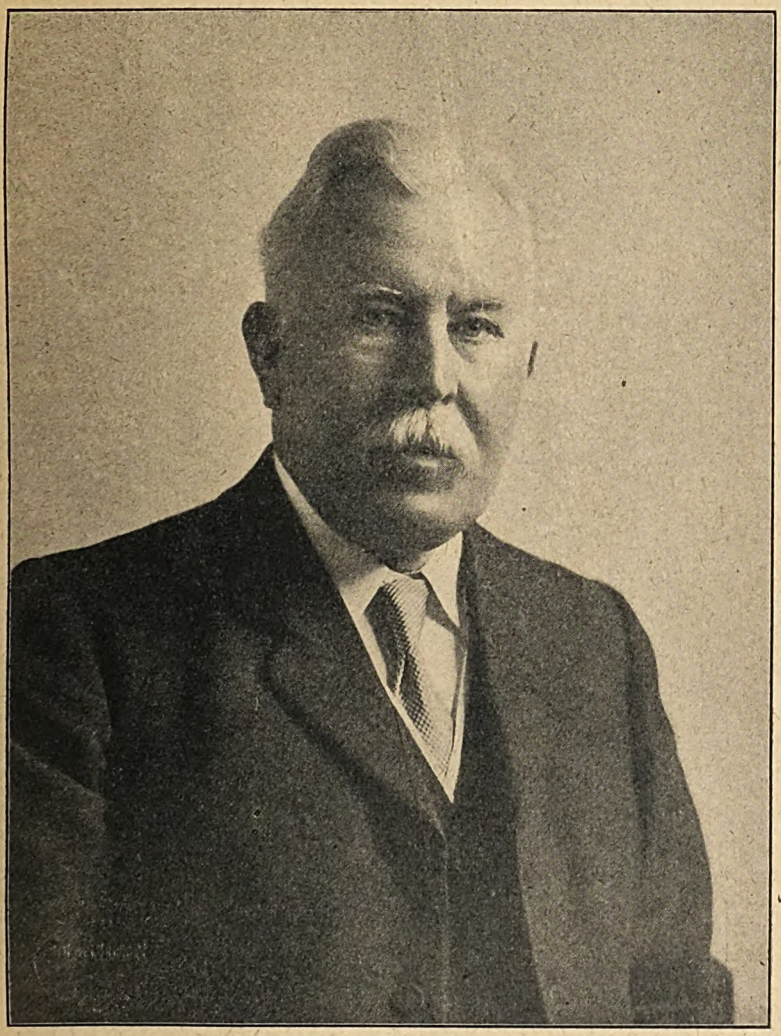

MR. JOHN A. F. ASPINALL.

General Manager: Lancashire and Yorkshire Railway.
Past-President: Institution of Mechanical Engineers.
Member of Council: Institution of Civil Engineers.

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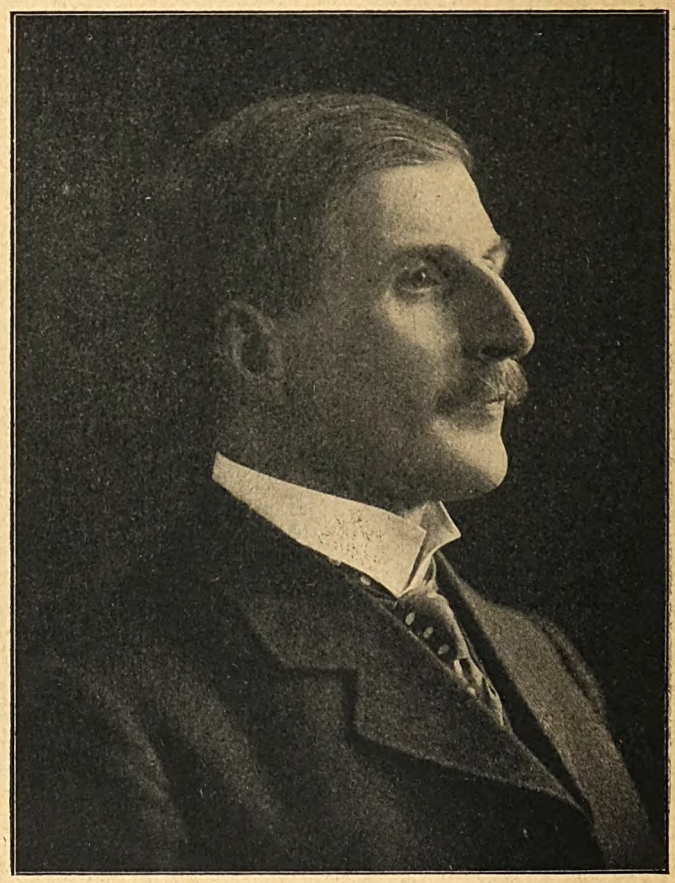
Both the sub-stations are linked up electrically with the Power Station by means of bare copper conductors carried on poles overhead along the line side in the open districts, or, in congested areas, by three-core cables carried on short stumps and brackets.

The new features of the electrification scheme are the adoption of high tension direct current (1,200 volts) and the special form of third rail. The essential features of the latter are the introduction of a side contact, and complete protection of the rail by wood guarding. The rail is of channel form, with a head of sufficient section to provide a wide contact surface on the side. It is carried along the side of the running rails upon insulators secured by cleats to the sleepers to prevent lateral movement. The contact device is mounted on both sides of the motor bogies, and is pressed against the head of the rail by means of a coiled spring.

A "fourth" or "return" rail of square section is laid in the centre of each track and secured to the sleepers. It is connected electrically by means of copper bonds to the running rails.

The electric trains consist of either two three, four or five cars according to the requirements of the traffic, but the standard train has five bogie cars, the front, centre, and rear vehicles being third class motor cars, and the intermediate vehicles first and third class trailer cars. A feature of the design is that a driving compartment for the accommodation of a motorman is at each end of the cars, thus enabling the trains to be made up to any accommodation



Photo] [*Lafayette.*

MR. GEORGE HUGHES, M.I.MECH.E., M.INST.C.E.

Chief Mechanical Engineer,
Lancashire and Yorkshire Railway.

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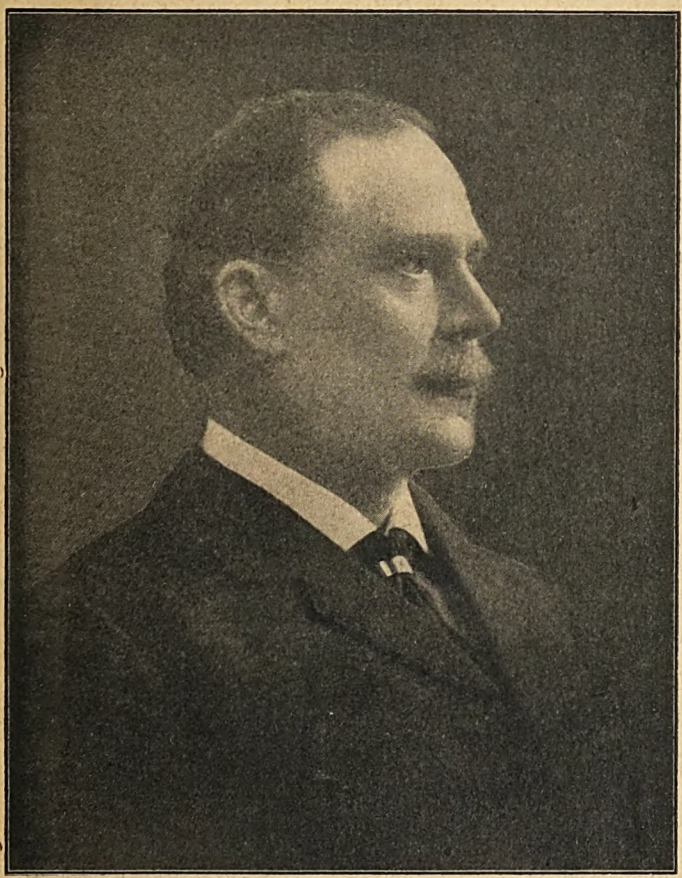
required with a minimum of shunting operations and time. The total length of a five-car train is 326 ft. 3 in. overall, providing seats for 72 first class, and 317 third class, or a total of 389 passengers.

Each motor car is carried on two bogies, on each of which is mounted two 200 h.p. electric motors, operated at a voltage of 1,200 direct current. Thus the total horse power of each motor-car is 800, and that of a five-car train 2,400 h.p. The cars are of the multiple unit type, the control equipment being that of Messrs. Dick, Kerr & Co., Ltd. A special high tension compartment is provided at each end of the motor cars in which all high tension gear is housed; the door is automatically locked when the current is on the car, thus ensuring complete protection from the high tension current to the passengers and train staff.

The cars are entered at the ends of the vehicles, and vestibule gangways are provided throughout the train so that passengers can pass from one car to another. The usual stepboard used on most British trains is dispensed with. Each car is divided into two main passenger compartments with a centre aisle, fixed and reversible seats being arranged alternately on either side; the first class seats are upholstered in tapestry and the third class in rattan, the former having the floors carpeted.

An important feature from a public point of view is that timber has been entirely superseded by metal in the construction of the cars, the vehicles being therefore entirely fireproof and much stronger to resist the effects of accident. Framework is entirely of steel and the panelling of the sides of the car and roof



Photo] [*Lafayette.*

MR. D. C. RATTRAY, M.INST.C.E.
Chief Civil Engineer,
Lancashire and Yorkshire Railway.

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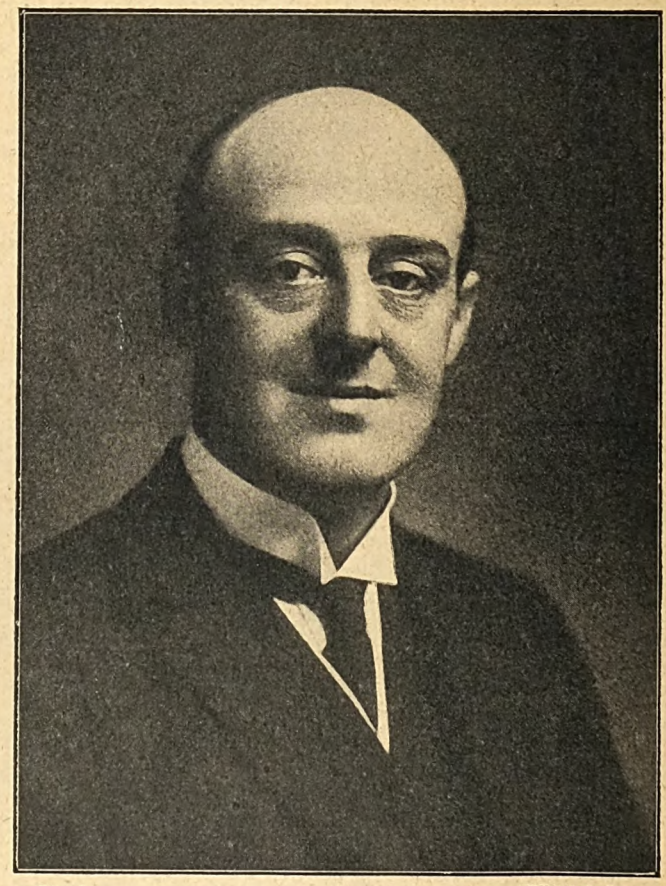
is made up of aluminium sheets, the interior work being finished with mouldings of drawn steel and aluminium sections. Luggage racks, air extractors, and electrical fittings, together with all inside furniture of the cars are in polished aluminium. The floor is built up of a special dovetailed form of galvanised sheets rivetted to the steel frame, and on which is laid an insulated cement floor.

The "all-metal" car has been largely introduced in America and to some extent in this country, but the term is somewhat of a misnomer as timber has been extensively used for windows, seats, packings, and other fittings. It is therefore a point of some importance that the cars which run on the Manchester and Bury electric line are no doubt the first passenger cars in either country, and probably in the world, in which metal has superseded wood entirely in the construction of the vehicles.

Other interior fittings specially noted are the arrangement of electric lighting and heating, the former of which gives an excellent distribution of light, and the latter arranged in ducts along either side of the car at the floor level will ensure comfort in the coldest weather. Electric fans are also fitted in all cars, arranged by means of a switch to either supply fresh air from the outside of the car or extract foul air from inside.



Photo] [*Elliott & Fry.*

MR. ARTHUR WATSON, M.INST.C.E.
Superintendent of the Line,
Lancashire and Yorkshire Railway.

A novelty is provided by the interior painting of the cars being finished in self-colours. The lower portion of the body is in dark brown with a restful shade of green above the bottom panels to the cornice, whilst the roof is of white. Large panorama photographs of places of interest add a pleasing effect to the inside decorative arrangements.

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Locomotive and Train Working in the latter part of the 19th Century.

THE GREAT WESTERN RAILWAY (Standard Gauge). [No. I.]

By E. L. AHRONS, M.I.Mech.E., M.I.Loco.E.

THE Great Western Railway Locomotive Department was then, as now, divided into two divisions, the Southern with headquarters at Swindon, and the Northern controlled from Wolverhampton. The latter division was, however, under the chief locomotive engineer at Swindon, although it was allowed a large amount of independence. The reason for this lay in the fact that Wolverhampton and not Swindon had been the cradle of the "narrow" or standard gauge on the Great Western Railway.

The works there had originally been those of the Shrewsbury and Birmingham Railway, which, together with the Shrewsbury and Chester Railway, had been taken over at the end of 1854 and formed the first "narrow" gauge section of the line. Mr. (afterwards Sir) Daniel Gooch was until 1864 the chief locomotive engineer of the whole line at Swindon, and Mr. Joseph Armstrong was at the head of "narrow" gauge locomotive affairs at Wolverhampton. On the resignation of Sir Daniel in 1864, Mr. Armstrong was appointed to the chief locomotive superintendency at Swindon, and on his death he was succeeded in 1877 by Mr. William Dean, from Wolverhampton, and the headship of the Northern division was then vested in Mr. George Armstrong, the brother of the late chief at Swindon.

For this reason probably Mr. George Armstrong enjoyed a considerable amount of independence, and, subject to approval from Swindon, designed and built a large number of the Northern division engines at Wolverhampton works. The result was that a Northern division engine was easily distinguishable from one built or repaired at Swindon. The "rolled" copper top chimney used by Mr. Joseph Armstrong both at Swindon and at Wolverhampton in the later years of his superintendency, was continued in use by Mr. George Armstrong, whereas Mr. Dean had from 1882 used the somewhat neater and more modern pattern.

During the years 1881–2–3, when only domeless engines were built at Swindon, those built at Wolverhampton retained domed boilers. The colours of the engines were also distinguishable in that Swindon adopted a medium green with underframes and splashers of a light chocolate colour, whilst the Wolverhampton engines were of a distinctly blue-green shade, picked out with red instead of white lines, and the underframes were of a dark red-brown shade different from that of the Swindon engines. All the locomotive stations north of, but not including, Oxford were contained in the Northern division, also all the West Midland stations as far as and including Pontypool Road, but Aberdare was a Southern division shed.

If a reader of the RAILWAY MAGAZINE were to imagine himself spending a few hours at one of the Great Western Railway main line suburban stations, such as Ealing, in the year 1880, the first thing that he might remark upon would have been the almost complete absence of four-coupled tender engines in the London district. In fact, there was hardly ever one to be seen, and the whole of the main line service from London, both express and slow trains, was monopolised by "single" engines.

In 1882, three or four new 6 ft. 6 in. coupled engines of the 2211 to 2220 class were stationed at Westbourne Park, but it always seemed as if their presence was deemed an impertinent intrusion, for they were mostly used for special excursions and for some local trains which made Reading their furthest objective. In this and many other respects the Great Western Railway was *facile princeps* the most conservative railway in the country. It took many years

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to break down this strong wall of tradition, or even to make a small breach in it; but at the beginning of the present century the whole structure came down.

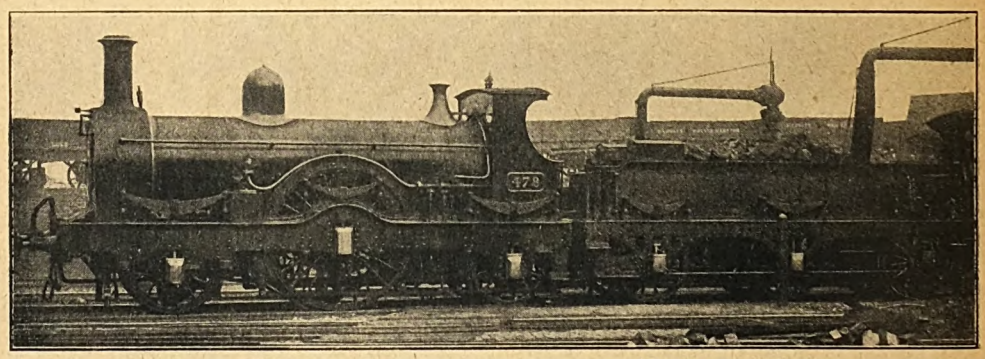
Four-coupled express engines not only appeared in large numbers, but went also, and their places were in turn taken by the modern six-coupled express engines, and now the once-famous "single" engines have completely disappeared.

The same rapid iconoclastic revolution has taken place in regard to the train services; so much so that it may be stated with impartial fairness that the Great Western Railway is now at the front in everything that appertains to excellence in modern railway working. I am afraid, however, that were some of the old Paddington or Swindon stagers of the "seventies" to revisit their quondam places, they would consider that the old line had "gone to the dogs" utterly beyond redemption.

The express service between London and Bristol was with one or two exceptions performed by the broad gauge trains, but as far as Swindon there were a number of fast standard gauge trains, mainly for the South Wales service. These expresses were considered by the Great Western Railway authorities as a sort of *omnium gatherum*, for they not only included a considerable load for Swansea and New Milford, but generally had carriages for Cheltenham and Weymouth, and some in addition had Bristol portions and Hereford coaches. The result was that they were much the heaviest Great Western Railway trains running, and on their arrival at Swindon, there was a very deliberate detaching and re-marshalling into fresh trains for their ultimate destinations.

On some railways the arrival of one or two of these trains would have caused something of a commotion amongst the station staff, but 30 years ago on the Great Western time was apparently of little importance, so that the process of re-sorting-coaches was undertaken in that stately manner which was then a feature of this classic railway.

In 1880 there were four fast down trains between Paddington and Swindon—additional to the broad gauge expresses. The best of these was the 5.15 p.m. South Wales express, which reached Swindon at 7.10 p.m. with a 5 min. stop at Reading. The South Wales night mails were conveyed by the broad gauge 9 p.m. from London, and transhipped at Swindon into a train which left that station at 11.20 p.m. for New Milford. A short time afterwards the mail trains were separated and a new standard gauge through mail train left Paddington for South Wales at 9.15 p.m.



"SIR DANIEL" CLASS. 7 FT. SINGLE, CYLINDER 17 IN. BY 24 IN. BUILT AT SWINDON 1866—1869.

The up trains were rather better as regards speed. The best of these was a combined Cheltenham and Bristol express, the portions of which were joined at Swindon. This train left Bristol at 7.50 a.m., and reached Swindon at 8.55 a.m., having stopped at Bath and Chippenham, leaving Swindon at 9.5 a.m. it ran thence to Reading (41¼ miles) in 50 min., including the slack through Didcot to 25 miles per hour. Leaving Reading at 10 a.m., it was due at Paddington at 10.45 a.m. I shall return to this train later when dealing with the locomotive working.

The up South Wales express which left Swindon at 3.55 p.m. was the only other up train in 1880 which deserves mention. This ran from Didcot to Westbourne Park (51⅞ miles) in 68 min. Both of the above trains developed into very heavy expresses, and

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from 1885 onwards loaded from 180 to 240 tons.

I am not sure of the exact year—but I think it would be in 1884—when one or two of the standard gauge trains began to perform the Paddington–Swindon journey without a stop, and at first there was one such train in each direction. The down express was the old 5.15 p.m. South Wales express, generally known as the "New Milford boat train," which was altered to leave Paddington at 5.45 p.m. and reach Swindon at 7.22 p.m. The time allowance was thus 97 min. for the 77¼ miles, 10 min. more than that of the broad gauge "Dutchman" and "Zulu," and a running average of 47·8 miles per hour.

There was for many years a deep-rooted idea in Paddington minds that it was utterly impossible for a standard gauge train to run as fast as a broad gauge train, and the authorities could not for a long time be brought to reduce the 95 or 97 min. allowance for the Paddington-Swindon runs. In the case, however, of the 5.45 p.m. down, this was perhaps excusable, for this was really a heavy express, and in addition to the main South Wales portion had coaches for Weymouth and Cheltenham. Its load was at least 150 tons, and very frequently amounted to more than 200 tons, so that I feel sure that it would have never been able to keep time on the 87 min. schedule of the "Dutchman."

But there was also an additional up Bristol express which left Swindon at 10.50 a.m. and reached Paddington without stopping at 12.25 p.m. This train was particularly light, much the lightest of the day, and rarely if ever exceeded 90 to 100 tons. It could easily have run from Swindon to London in the 87 min. timing of the "Dutchman." But no! the fiat had gone forth that being a standard gauge express, it must be impossible to run at broad gauge speed, and although it was always worked by one of the somewhat smaller 7 ft. singles of the "Sir Daniel" class, the Bristol driver in charge sauntered up to London in a vain endeavour not to gain time.

There may also have been another reason lurking in the Paddington mind. All trains except the "Dutchman" and "Zulu" conveyed third class passengers, and this type of being was not *persona grata* with the Great Western Railway. Consequently to convey him from Swindon to London or *vice versa* at first class speed was a thing not to be thought of under any consideration.

The last-mentioned up express was, I believe, until 1890, the only standard gauge Exeter and Bristol express which had a self-contained existence, that is, it was not merely a two coach addendum attached at Swindon to a South Wales train. It left Exeter at 7.5 a.m., Bristol at 9.35 a.m., and reached Swindon at 10.40 a.m. after stopping at Bath and Chippenham. It had no South Wales coaches from Swindon, although it connected with a slow train from Gloucester and beyond. This train slipped a coach at Reading.

The employment of the Severn Tunnel for through expresses from London to South Wales was the cause of a gradual but steady acceleration in the standard gauge trains between London—Swindon—Bath, etc. The first down express to be altered was the 10.15 a.m. from Paddington, which in 1887, was divided at Swindon into two portions, of which the leading one travelled *viâ* Bath and Stapleton Road to Severn Tunnel Junction. About two years later this train was altered to leave London at 9.45 a.m. and was given a through run to Swindon in the usual "narrow" gauge time of 95 min.

In 1891 there was a second Severn Tunnel express, the 3.10 p.m. from Paddington, which arrived at Swindon at 4.40 p.m.—a 90 min. run, and an inclusive speed of 51½ miles per hour. This was the fastest standard gauge timing up to that date. The above two trains, together with the older 5.45 p.m. Milford boat train, provided the three non-stop runs then existing for "narrow" gauge down trains between London and Swindon. The 11.50 a.m. Weymouth express from London and the 6.20 p.m. Bristol fast were each allowed 50 min. for the Reading-Swindon run (41¼ miles).

Of the up trains in 1891 the old 9.5 a.m. had been altered to 9 a.m. from Swindon, the Reading stop replaced by a "slip," and the somewhat generous allowance of 100 min. was given for a non-stop run to Paddington. The 10.50 a.m. from Swindon (Bristol express) remained as before, but there were two new up South Wales expresses, one of which, the 1.5 p.m. from Swindon, was booked in the minimum timing of 90 min., and the other, the 3.31 p.m. from Swindon was allowed 94 min. These provided between them four non-stop up expresses daily.

In addition a number of other fast trains had been much improved. Thus the 7.15 p.m. from Swindon was given 1 hour 40 min. to Paddington with a five-minute stop at

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Reading. Moreover our old broad gauge friend the up express which had collected many passengers in the west, and eventuated as the 3 p.m. from Bristol, had by this time tied itself into such a hopeless knot, that Paddington had to throw all precedents to the winds, and run a "*narrow gauge*" relief express from Exeter *via* Weston-super-Mare. This gave an extra fast train from Bristol at 2.45 p.m., with stops at Bath, Swindon, Reading, and Westbourne Park. The other main line express service from Paddington was that to Oxford, Birmingham Wolverhampton and the north-west. Chronologically this was the earliest of the standard gauge train services, for the first "narrow-gauge" express from London ran to the north on October 1st, 1861..

Until the year 1880 there was nothing exceptional to be noted in the speed of these trains, of which there were six in each direction, making stops at Westbourne Park, Reading, Oxford, Banbury, Leamington and Birmingham, and some of them added Didcot and Warwick. The best train ran from Reading to Oxford, 27½ miles, in 39 min.

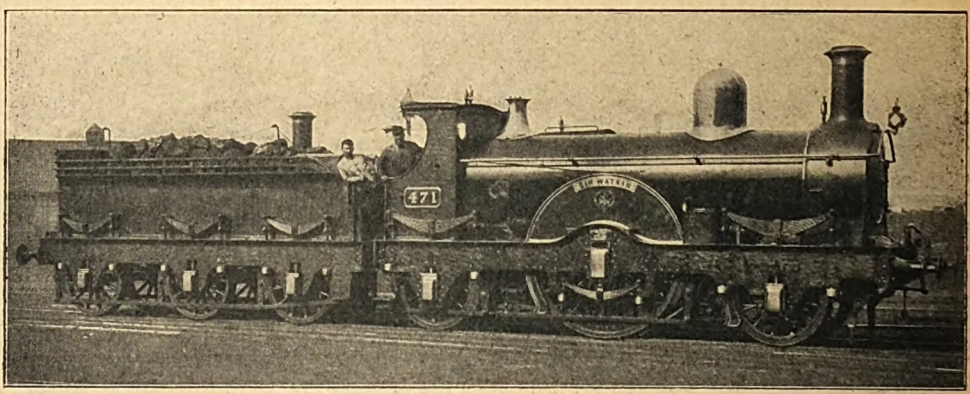
In 1880 a new and really good express was added in each direction. The down train was the celebrated 4.45 p.m. from Paddington, which began to run on the same day as the 3.0 p.m. broad gauge "Zulu." It was occasionally known as the "Afghan," but this name was applied only between Didcot and London, probably to distinguish it from the broad gauge "Zulu." The northern men generally referred to it as the "Zulu," and sometimes as the "Northern Zulu."

The 4.45 p.m. was for many years much the finest and fastest narrow gauge express, and was timed to Wolverhampton as follows:—

Miles.				Speed.
—	Paddington	dep.	4.45	48·8
63½	Oxford ..	arr.	6.3	
	,, ..	dep.	6.8	49·3
129¼	Birmingham	arr.	7.27	
	,,	dep.	7.30	38·8
141½	Wolverhampton	arr.	7.49	

A carriage was slipped at Leamington at 6.58 p.m. In the course of a few years it became a heavy train, and usually consisted of five (frequently six) 8-wheeled coaches for the north (one of which was slipped at Leamington) with an additional three for Worcester, detached at Oxford. I frequently rode on the engines of this train and will mention it again later.

The corresponding up express (from Birkenhead) left Wolverhampton at 2.5 p.m., Birmingham at 2.30 p.m., but put in an additional stop at Leamington, and reached Paddington at 5.25 p.m. The Oxford-Paddington run was booked in 80 min., as against 78 min. for the down train. Some years afterwards a new down express was put on to leave Paddington at 9.55 a.m., which was also allowed 78 min. to Oxford, and this was followed by two more, the 1.30 p.m. and 8.0 p.m. down trains, also with the same timing. All these trains stopped at Leamington, for the 4.45 p.m. remained the only one which ran from Oxford to Birmingham without stopping. There were in 1891 four runs from Oxford to Leamington, 42 miles 46 chains in 51 min., a speed of just over 50 miles per hour. The up "Northern Zulu" was altered to leave Birmingham at 2.40 p.m., and was allowed 53 min. from Leamington to Oxford, and retained the



Photo] [*The Locomotive Publishing Co., Ltd.*

471, *Sir Watkin*, 7 FT. SINGLE. REBUILT AT SWINDON.

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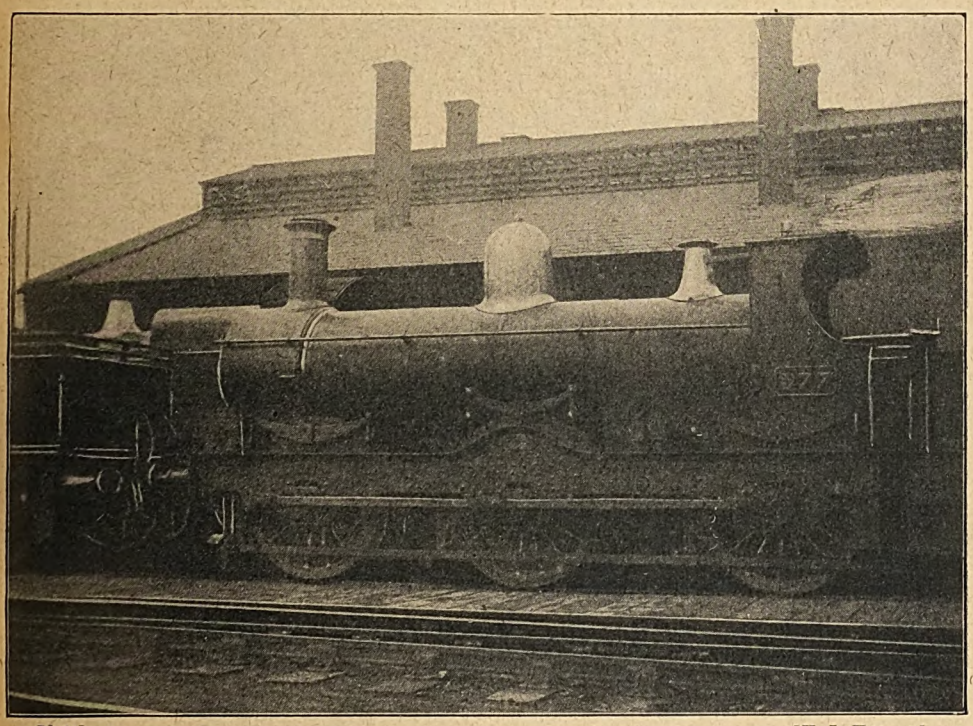
80 min. timing from Oxford to London.

Having dealt with the main line train services from Paddington, something may now be said of the engines which worked them. The whole of the burden of the express services between London and Swindon and London and Wolverhampton, with the exception of one or two trains, fell upon the shoulders of 31 7 ft. singles with 18 in. by 24 in. cylinders; the 999, known as the "Queen" or "Sir Alexander" class, and the 157 to 166 class. An exception was the 9.35 a.m. from Bristol (the 10.50 a.m. from Swindon already mentioned) which was run by one of the somewhat smaller 7 ft. singles—the "Sir Daniel" class—with 17 in. by 24 in. cylinders. As these were the older engines, I will give some particulars of them first.

There were 30 of the "Sir Daniels," ten of which, Nos. 378 to 387, had been built at Swindon in 1866, and the remainder, Nos. 471 to 480 and Nos. 577 to 586, in 1869. Until the appearance in 1875 of the "Sir Alexander" class, they ran the majority of the standard gauge expresses. The wheel base was 16 ft. and they had excellent boilers with 1,269 sq. ft. of heating surface.

In respect of a generous allowance of heating surface for comparatively small cylinders, 17 in. and 18 in. by 24 in., the Great Western was always to the fore, and unlike the London and North Western Railway and Great Northern Railway, they provided a large 5 in. or 5¼ in. blast pipe, so that the engines ran easily without pulling at the fire, and throwing out sparks. In fact it was very rare indeed to see sparks issue from the chimney of a Great Western passenger engine, although I am writing of the days before spark arresters were provided.



Photo] [*H. L. Hopwood.*

NO. 577, A GOODS ENGINE AS RECONSTRUCTED FROM A 7 FT. SINGLE OF THE "SIR DANIEL" CLASS.

The 1888–1890 rebuilds, such as *Sir Watkin,* had boilers with 1,250 sq. ft. of heating surface, of which 104 sq. ft. were provided by the firebox. Originally the weight of these engines had been about 29¼ tons, of which 12 tons 8 cwt. were carried on the "drivers," but their later weight was increased to 31½ tons with 14 tons on the driving wheels.

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Four of the class always had names—No. 378 *Sir Daniel*, No. 380 *North Star*, No. 381 *Morning Star*, and No. 471 *Sir Watkin*.

After 1880 the whole of the thirty, with the exception of Nos. 378, 473 and 578, were stationed at Oxford and Bristol. The Bristol engines of the class ran two trains daily to London, one being the 9.35 a.m. express from Bristol; two extra turns to Swindon; and they also worked almost the whole of the stopping train service between Bristol and Exeter. On this section the standard gauge trains travelled *viâ* the Weston-super-Mare loop.

The Oxford engines had no real express trains to work, though they ran one or two semi-fast trains to London. They also worked most of the stopping trains on the old loop line from Oxford to Maidenhead *viâ* High Wycombe, and practically the whole of the through slow train service between Oxford and Wolverhampton *viâ* Birmingham. They had in addition two trains to Worcester. The three engines of the "Sir Daniel" class in the northern division will be mentioned later.

The last days of the "Sir Daniels" were notable for a unique and surprising conversion, for in 1899–1901 the whole of the thirty 7 ft. singles were altered into 0–6–0 goods engines. Moreover, this conversion was a genuine rebuild, in which the old frames, motion, etc., were used. The "Sir Daniels" had originally been constructed with cylinders and motion interchangeable, with Mr. Armstrong's standard 5 ft. goods engines, and it was probably this feature that decided Mr. Dean to rebuild them as somewhat similar engines, when they had become too light for passenger service. The old bent round framing and platform above the driving axle-boxes, which was a necessary feature of the 7 ft. singles, was retained in the rebuilt goods engines and gave them a curious appearance.

The only other instance of such a conversion from single express engines to 0–6–0 engines was that of three old London, Brighton and South Coast Railway engines designed by Mr. John Gray and built by Messrs. Hackworth, which, after an intermediate conversion to 2–4–0 passenger engines, finally blossomed forth under Mr. Craven as six-coupled tank engines, but in this instance I am afraid that by the time they had reached the tank engine stage, there was nothing of the original engines left except the spaces between the wheels.

(*To be continued.*)

DON'T FORGET
YOUR FRIEND
IN THE FORCES.
SEND HIM A
RAILWAY MAGAZINE.

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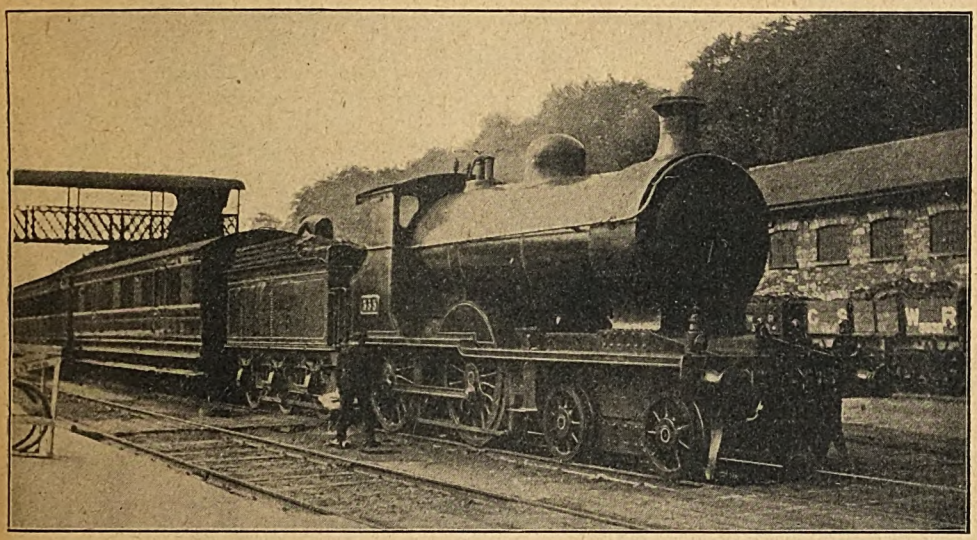

Photo] [*D. B. Bradshaw.*

GREAT SOUTHERN AND WESTERN RAILWAY.

Train at Mallow station.
4–4–0 engine No. 335.

British Locomotive Practice and Performance.

By CECIL J. ALLEN.

SO the Birmingham services have at last come under the ruthless hand of War Economy! Present circumstances duly considered, the number of expresses between London and Birmingham is still indisputably a wonderful one, but somehow the added 10 minutes just spoils the euphony of the times and extracts the "spice" from the performance as well. Preliminary announcements of the two railway companies concerned were couched in somewhat elusive terms—certain expresses were to "start earlier," that was all! But the January time-tables revealed the naked truth that they were also going to arrive later or at the same time as before. By the time these lines are in print, we shall be more or less hardened to these "tragedies," but I am writing in the middle of January, while the changes are still fresh in mind. Speaking personally, I must confess that I regret this particular deceleration more than any other alteration that War conditions have yet produced, and I sincerely trust that it may not prove a permanent legacy of the conflict.

To the observer of locomotive performance there has always been a peculiar interest in the running of the 2-hour expresses between London and Birmingham by either route, representing as they have done, all the year round, some of the best locomotive work of both companies. My preferences have, I must confess, lain mostly with the Great Western route, which, with its very much greater difficulty in the matter of grades and slacks, in addition to the stops on certain down trains and all up expresses, has proved a little more attractive than the uniformity of the London and North Western run, notwithstanding the heavier average loads and longer distance of the Euston route.

By the insertion of stops in place of certain slip coaches, however, some quite good times remain—times, indeed, that would very likely seem noteworthy had we not the standard of the 2-hour expresses by which to judge. On the London and North Western Railway the most smartly timed down express is probably the 9.15 a.m.—late 9.20—*ex*-Euston, which, with its substantial

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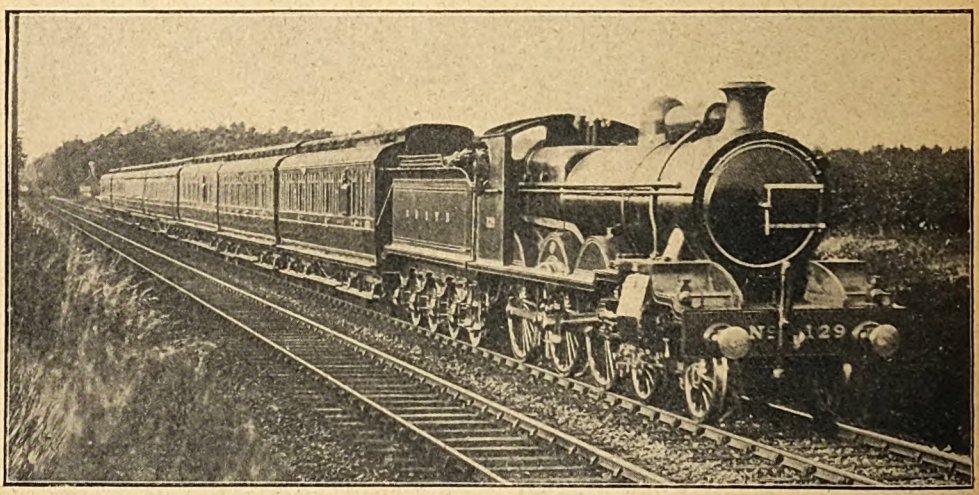
normal load will not have many minutes to spare on a schedule of 135 min., with three intermediate stops. Of the point to point times the best is that of 61 min. for the 57¼ miles from Willesden to Blisworth—an average of 56·3 m.p.h. But this time presupposes that the train will get away from Willesden 11 min. after leaving Euston, which is decidedly improbable. Consequently the time may be reduced to 60 or 59 min., or else it may be needful to make up the loss on the next section from Blisworth to Coventry—a distance of 31⅜ miles, allowed 35 min. The latter average is also as high as 53·8 m.p.h., and includes Rugby slack. For the final 18⅞ miles into Birmingham 22 min. are allowed, or 51·5 m.p.h. average. Thus this train will still be worth watching from the timing standpoint. Its counterpart—the 3.40 p.m. *ex*-New Street—retains its old timings, but usually carries a rather lighter load. These times are 21 min. to Coventry—a really brilliant average of all but 54 m.p.h. over this short distance—36 min. from Coventry to Blisworth, should the train get away from Coventry 23 min. after leaving Birmingham, and 48 min. from Blisworth to Watford, 45¼ miles. The latter is really a conditional stop, but this average of 56·6 m.p.h. must be maintained when the stop is made.

Of the previous 2-hour expresses, the 1.20 p.m. *ex*-Euston now makes two stops, in which to justify its increased allowance of 10 min.; the start-to-stop time of 90 min. to Rugby is the fastest yet booked, although 3 min. over the previous time to passing that town. A call is also made at Coventry instead of slipping. The 4.35 and 6.50 p.m.—late 4.45 and 6.55 respectively—run non-stop to Coventry, 94⅛ miles, in 102 min., at an average of 55·5 m.p.h., or but very little slower than their previous schedule to this point. But an ample allowance of time thence to Birmingham affords a recovery margin in case of delays on the earlier part of the journey. The two remaining down expresses, at 11.40 a.m. and 2.25 p.m.—previously 11.50 and 2.30—while away their extra 10 min. on the road, and the latter, in particular, with its light load, should not suffer from any particular inability to keep time. Of the up expresses the 8.40 a.m. and the 6.20 p.m. call at Coventry, and run up to town in 104 min., while the 5 p.m. starts at 4.50 p.m. and calls at Blisworth instead of slipping. For the first stage—50¼ miles—of its journey 56 min. are allowed, and for the second, 62¾ miles, an easy timing of 71 min. The 11.20 a.m.—late 11.25—and the 2.45 p.m. expresses proceed in leisurely fashion up to town with 10 min. extra in journey time and nothing to set against it, while the 12.40 p.m. up disappears. As regards other expresses the heavily-laden 4 p.m. down Liverpool and Manchester express starts 5 min. earlier and has the time added to its schedule, while the long-suffering 8.30 a.m.



Photo] [*F. E. Mackay.*

GLASGOW AND SOUTH WESTERN RAILWAY.

Glasgow–St. Pancras express.
4–6–0 locomotive No. 129.
Schmidt superheater and Weir feed-water heater.

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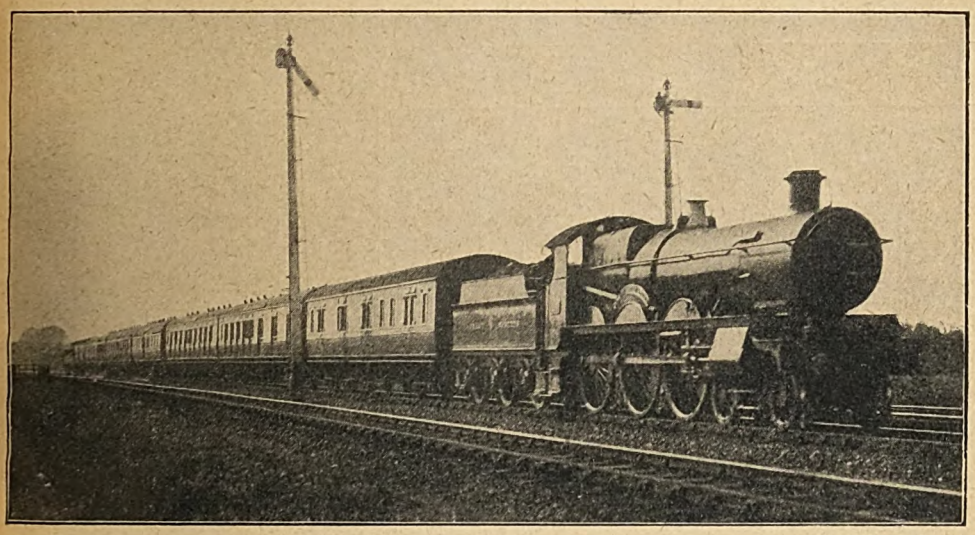
from Manchester to London puts on yet another 5 min., and arrives 15 min. after its original arrival time of 12.20 p.m. Curiously enough the initial times of this train from Manchester to Stoke, which are but rarely observed, remain as they were.

The Great Western Railway Birmingham service is made to suffer in exactly the same way as that of the competing company, although the more difficult 3 hours' schedules to and from Exeter remain as they were. But the insertion of one or two stops in certain cases somewhat mitigates the disappointment of pure and simple deceleration. Thus the 9.10 a.m. *ex*-Paddington calls at Leamington instead of slipping, and, although it is now allowed 32 min. for the 26½ miles from Paddington to High Wycombe, the ensuing 60¾ miles to Leamington, start to stop, are booked to be covered in 65 min., at an average speed of 56·1 m.p.h. For the final 23¼ miles into Birmingham the allowance is 28 min. No stops are included in the schedules of any of the other down expresses, and the time of 130 min. for the journey of 110½ miles calls for quite modest locomotive achievement, unless the loads be exceptionally heavy. Coming up, the standard time for the 23¼ miles from Birmingham to Leamington is increased from 26 to 27 min., and then, after a wait of 4 instead of 3 min., the Leamington-London time puts on a solid increase of 8 min.—from 91 to 99 min. The average speed over this stretch is thereby reduced from 57·5 to 52·9 m.p.h., and the booking descends from the highest plane of locomotive performance to the level of mediocrity, especially with the modest loads usually conveyed south of Leamington. The 8.55 a.m. and 11.20 a.m. up have also a call to make at Banbury, and run up from there in 73 min., necessitating a much better average speed for this 67½ miles' distance of 55·5 m.p.h. Beyond the Birmingham service the only main line alteration of note is the extra 10 min. allowed the 1.5 p.m. express from Paddington to Bristol—a remarkably generous concession for a halt of 2 min. at Reading. For the 36 miles to Reading 40 min. are allowed, and for the 81½ miles thence to Bristol, *viâ* Badminton, 88 min. One cannot help deploring these retrograde movements, but, all things considered, it is impossible not to marvel that long distance travel facilities, both as regards number of trains, speed, comfort and convenience, are so little impaired—so little, indeed, that very few persons other than the habitual traveller would notice any difference at all. In any case, it is far preferable thus to decelerate trains than to maintain on paper times which, by reason of overloading or other difficulties, can no longer be observed.



Photo] [*H. T. Worlock.*

UP SOUTH WALES EXPRESS, NEAR HAYES.

4–6–0 two-cylinder engine No. 2914 *Saint Augustine.*

Certain references that I made in the January article to locomotive performance on the Great Western Railway appear, by letters from several correspondents, to have

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conveyed a meaning which I am sure did not enter my mind at the time of writing them. All that I said, in commenting upon a rather extravagantly worded postcard from a friend who has since declared himself to be a "violent supporter" of the Great Western Railway, was that I could not fully subscribe to his "creed," and that most of my recent runs on the Great Western Railway had been rather disappointing in character. No disparagement of the line in question was intended—not in the slightest degree—and for the obvious reason that some of the finest running records I possess have been obtained on the Great Western Railway. Indeed, what I said was not an expression of opinion, but a statement of fact, which might easily apply to almost any British line at the present time. Another correspondent introduces himself as "a keen railwayist with Great Western Railway leanings," and further exceedingly candid remarks in his letter make this fact unmistakably apparent. It is difficult, I know, to avoid developing a bias in these matters. I am reputed to have one myself, and I am not sure that I can deny it. But this leaning is due to the fact that, until the commencement of the War, I had recorded more *consistently* good work and time-keeping generally on a certain leading railway, under all circumstances, than on any other. Of this the contents of various note-books afford ample proof. No responsible observer, however, would allow any such

G.W.R.—Paddington to Taunton and Exeter.

Run No.	4	5	6	7
Train (*ex*-Paddington)	10.30 a.m.	3.30 p.m.	2.45 p.m.	1.45 p.m. *ex*-Exeter
Engine 4-6-0 No.	2923 (2-cyl.)	4004 (4-cyl.)	4013 (4-cyl.)	4011 (4-cyl.)
,, Name	*St. George*	*Morning Star*	*Kt. of St. Patrick*	*Knight of the Garter*
,, Driver	Rowe	Finch	Morgan	Nork
Tare Load (tons)	¶340	§287	†339	361

Distance.	Stations.		Schedule Time.	Actual Time.	Actual Time.	Actual Time.	Distance.	Schedule Time.	Actual Time.
M. C.			Min.	M. S.	M. S.	M. S.	M. C.	Min.	M. S.
0.0	Paddington ..	dep.	0	0.00	0.00	0.00	173.53	180	182.45
9. 6	Southall ..	pass	12	12.19	11.32	d 12.48	164.47	169½	l 169.25
18.36	Slough ..	,,	21	20.30	19.20	21.00	155.17	160½	161.10
24.19	Maidenhead ..	,,	26½	25.29	b 26.20	25.58	149.34	155	156.05
35.78	Reading* ..	,,	38	35.51	38.10	e 38.40	137.55	143	143.28
53. 6	Newbury ..	,,	57	54.55	55.50	f 57.49	120.47	125	126.52
70. 9	Savernake ..	,,	74	72.03	71.27	77.31	103.44	—	k 108.51
95.46	Westbury*	arr.	slip	slip	c 96.44	g slip	—	pass	pass
		dep.	97	95.07	98.26	102.11	78. 7	83½	82.00
101.26	Frome* ..	pass	104	103.26	107.18	h 110.20	72.27	—	—
108.43	M.-P. 122¾ ..	,,	114	112.42	115.59	119.08	65.10	69½	67.20
115.28	Castle Cary ..	,,	121	119.00	122.14	124.45	58.25	61½	59.20
142.70	Taunton	arr.	slip	a slip	d 152.04	150.30	‡35.65	‡37½	‡38.18
		dep.	149	147.53	153.12	—	30.63	32½	34.17
153.58	Whiteball ..	pass	161	160.43	166.42	—	19.75	23	25.44
173.53	Exeter ..	,,	180	‖179.18	186.50	—	0. 0	0	0.00
173.53	Net times (min.) ..		180	178¼	171½	††143½	173.53	180	176½

‖ Passing time. * Service slacks. ¶ 307 tons from Westbury and 274 from Taunton. § 262 tons from Westbury and 237 from Taunton. † 289 tons from Westbury. ‡ Cogload Junction times. †† To Taunton. a Signal checks approaching Taunton. b Severe signal check, Taplow. c Signals outside Westbury. d P.W. relaying slack, Curry Rivell. d Slight check, Old Oak. e Severe slack, Twyford. f Very severe slack, Newbury. g Signal check, Lavington. h Slight signal check, Witham. k P.W. bridge slack, very severe. l Signal stop, Royal Oak, 1 min. 40 sec.

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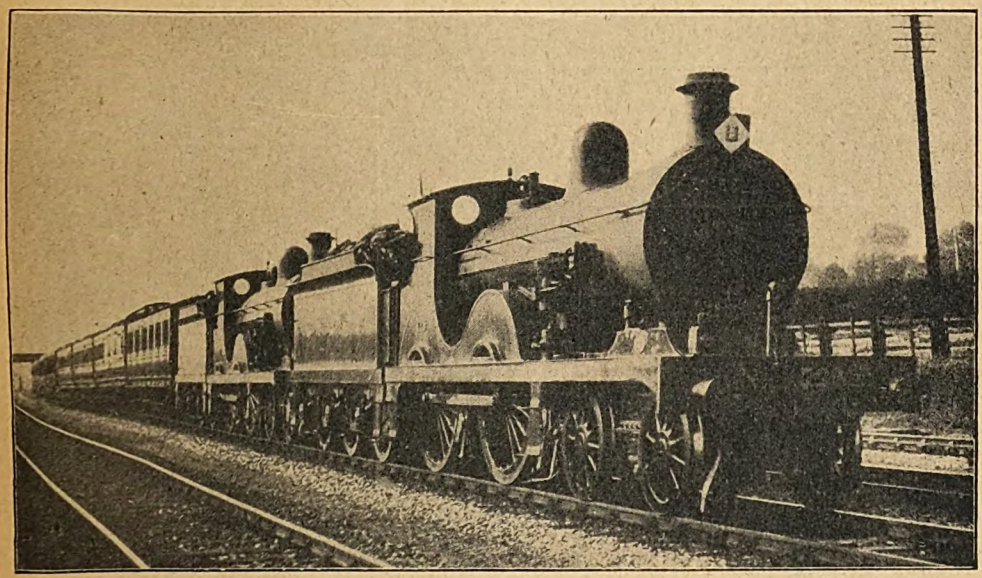
preference to affect his appreciation of good or even better locomotive work, wherever performed, or would dogmatize as to the merit of the locomotive work of that line in such a way as to exclude merit on any other.

Yet a third correspondent asks me whether I could name any trains, comparable in respect of distance covered, scheduled speed, intermediate grades and average loading, that keep better time than the 10.30 a.m., 12 noon, 1.30 and 3.30 p.m., *ex*-Paddington, and the corresponding up expresses due at 1.30, 3.10, 4.45 and 8.40 p.m. Speaking frankly, I am unable to say! Were it possible to find exact parallels on the lines of other companies, which is doubtful in view of the infinite variety of running conditions, one might venture to give a definite reply, but not otherwise.

As a matter of purely personal opinion, I very much doubt whether we have anything else in this country that quite compares in point of difficulty with the 3 hours' booking in each direction over the 173¾ miles between Paddington and Exeter, or the 150 min. booking for the 143 miles from Taunton to Paddington. The aggregate vertical rise from London to Exeter is certainly moderate, totalling as it does 1,080 ft. against the London and North Western 950 ft. to Crewe or the Great Northern 1,350 ft. to Doncaster. But there are three service slacks—a moderate one at Reading and two severe ones at Westbury and Frome—as compared with two moderate delays on the London and North Western and one severe slack on the Great Northern main lines. Both Doncaster and Crewe, even in times of normal working, do not average more than 5 min. under the "3 hours' radius" from London with heavy trains, although the former is 17¾ and the latter 15¾ miles nearer town. Even the greater average weight of the East and West Coast trains, or the Liverpool and Manchester expresses, does not altogether balance the account, as the standard Great Western engines have certainly proved their ability to keep the 3 hours' booking to Exeter with loads equally heavy, and even heavier, at the height of the summer season. It would be interesting if some formula could be devised to reduce time-table bookings to the same basis, taking into account all the variations in running conditions, but I have failed to discover anything that is likely to afford a satisfactory solution of the problem.



Photo] [*W. H. C. Kelland.*

SOUTH EASTERN AND CHATHAM RAILWAY.

Continental express (double-headed), passing Grove Park.

Some of the times on the Great Western Railway 2-hour service between London and Birmingham, again—until the January decelerations—would want a lot of beating. I have been quite surprised recently in applying the "vertical rise" test to this route—in my opinion the only really accurate measure of grading—to find how thoroughly difficult

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it is, with its long banks at 1 in 100 to 1 in 225 inclination. The aggregate vertical rise works out at 250 ft. from London to High Wycombe, 415 ft. to Princes Risborough, 775 ft. to Leamington, and 1,135 ft. to Birmingham. For a distance of 110½ miles the last-mentioned figure compares with the London and North Western Railway 665 ft. to Tamworth (110 miles), the London and South Western Railway 750 ft. to Bournemouth (108 miles), the Great Northern Railway 970 ft. to Barkstone (109¾ miles), the Great Eastern Railway 1,170 ft. to Trowse Upper Junction (112½ miles), the Midland 1,260 ft. to Loughborough (111½ miles), and the Great Central Railway 1,430 ft. to the same town (113 miles). Adding to this difficult grading the severe and prolonged slacks through High Wycombe and Leamington, and the moderate ones at Old Oak, Ashendon and Aynho Junctions which nevertheless appreciably affect the times, it will be seen that such a schedule speed as 55¼ m.p.h. between London and Birmingham is of quite an exceptional character. Especially is this the case with such down trains as the 9.10 a.m. or 6.5 p.m., the former with a stop at High Wycombe included, and the latter frequently loaded to 10 or 11 of the largest vehicles. Still more surprising are the original bookings of the up expresses, with a stop of 3 min. at Leamington, and an average speed of 57·5 m.p.h. thence to London. Even the 2-hour expresses between London and Bristol, with their more dazzling times, hardly attain to this standard, in view of the perfection of the road traversed, except perhaps the 5.5 p.m. up, which, with a heavier load than the midday train, the difficult start out to Filton on the Badminton route, and the slack at Reading through the platform road to slip the rear coach, certainly has to run hard all the way in order to keep time.

Other Great Western expresses might be named on which first-class work is necessary at all times with a view to maintaining schedule time, but where my friend of the postcard makes a mistake is in classing all Great Western speed on the basis of its most brilliant bookings, which, of course, is fallacious, as it would be on any line. Certain of the South Wales expresses, for example, and the semi-fast trains such as the 8.3 a.m. from Bath to London, which he cites, are quite easily timed. The making up of time lost by delays, of course, might transform any of these bookings from the level of mediocrity to that of brilliance, but in my experience the regaining of time on the Great Western Railway—as, again, on most lines—varies a good deal with different drivers, and I think I am correct in saying that it is not officially encouraged. Thus I really cannot subscribe to the dogma that the exceptional runs that have been recorded in these columns are "done by *every train* on the Great Western Railway." Nor, for that

G.W.R.—Paddington to Bath and Bristol.

Run No.			1		2		3	
Train (*ex*-Paddington)			10.50 a.m.		10.15 a.m.		4.15 p.m.	
Engine 4–6–0 No.			2971 (2-cyl.)		4007 (4-cyl.)		2930 (2-cyl.)	
„ Name			*Albion*		*Rising Star*		*Saint Vincent*	
„ Driver			Burden		Spackman		Croker	
Tare Load (tons)			305		216		485	
D's'nce M. C.	Stations		Schedule. Min.	Actual. M. S.	Schedule. Min.	Actual. M. S.	Schedule. Min.	Actual. M. S.
0. 0	Paddington	dep.	0	0.00	0	0.00	0	0.00
9. 6	Southall	pass	11	11.35	11	11.49	12	12.58
18.36	Slough	„	20	20.17	20	20.20	21	20.58
24.21	Maidenhead	„	25½	25.32	25½	25.29	26½	25.56
35.78	Reading	„	36	36.15	37	36.22 ‡‡	38	36.48
53. 9	Didcot	„	53	52.18	54	54.49	55	52.42
77.21	Swindon	„	77	*75.59	78	78.23	80	77.50 ‖
93.77	Chippenham	„	93	92.32 ††	95	93.20	97	97.50
106.69	Bath	„	107	‡105.14	¶108	¶105.26	§111	§111.13
118.30	Bristol	arr.	120	118.09	—	—	—	—
118.30	Net times (min.)		120	113½	†108	†103¼	†111	†106¼

‡ Service slack. * Series of signal checks. †† Signal check, Box. ‡‡ Signal checks, Pangbourne. ¶ Arrival of slip portion. § Arrival of train. † To Bath only. ‖ Bad p.w. check, Dauntsey.

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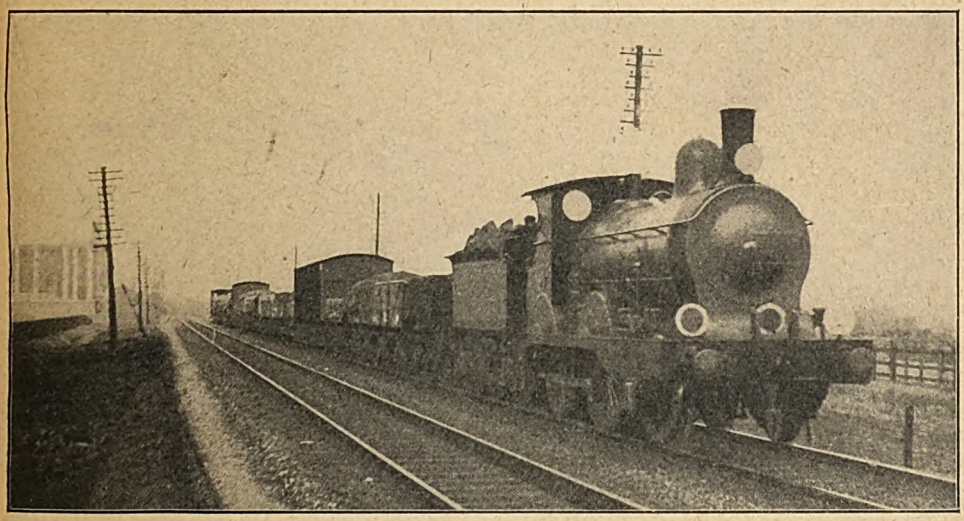
matter, could any other reasonably-minded observer. But I certainly do agree that I have timed some feats of locomotive performance on the Great Western Railway for which I have found no counterpart elsewhere.

The author of the historic postcard round which this discussion has been "waged," and with whom I have since enjoyed an extensive correspondence, turns out—even though on his own admission a "violent" partizan—to be a careful observer of locomotive performance, with some 120 runs on the Great Western Railway very minutely recorded, in many cases at every mile throughout the run. He has been kind enough to furnish me with details of 7 of his best runs, together with an explanatory letter, which he considers as the "brief" in support of his argument. I must again protest that I hold no brief on the other side—my object, indeed, is to maintain a position of "benevolent neutrality"—but in view of the exceptional interest of the subject I make no apology for reproducing my friend's letter almost *verbatim*. The runs are given in tabular form, Nos. 1 to 3 relating to the old West of England main line *viâ* Bath, while Nos. 4 to 7 were recorded on the Westbury route. It is worthy of note that the drivers mentioned include almost all the best-known men on the Great Western Railway, whose names have figured often in the articles of the late Mr. Charles Rous-Marten. Consequently the very "cream" of Great Western running is here represented. Further, the dates of these journeys are all anterior to 1911—as will be noticed by some of the starting times of trains since defunct or modified—so that the work described need not of necessity be taken as a commentary on current running. But without further ado let me get on to my friend's letter.

"In run No. 1," he writes, "the driver, Burden, was accompanied on the footplate by Inspector Greenaway. The engine was *Albion* in her original 2-cylinder 6-coupled state. By an excellent start, 60 m.p.h. was attained just before Ealing, 5½ miles out, and the 20 miles between mile-posts 16 and 36 were covered in 18 min. 9 sec. (=66·5 m.p.h.). In 2 sec. under the first hour 61 miles were covered, and speed did not fall below 62 once until at the 75¼ mile-post a severe signal check occurred. This check lasted right through Swindon, and we did not begin to get away again until mile-post 77¼, the check costing 3 min. 21 sec. Descending towards Chippenham 80 m.p.h. was the highest speed, and just before the Box Tunnel we lost another 80 sec. through signals. Between Bath and Bristol"—after the customary and severe slack through Bath, it should be noted—"a speed of 67 m.p.h. was regained and maintained for the two miles between mile-posts 113 and 115. The net time works out at 113½ min. for the 118½ miles' journey, and it will be observed how even the running was throughout. It



Photo] *K. A. C. R. Nunn.*

GREAT EASTERN RAILWAY.
Goods train approaching Park station.
Mixed traffic engine No. 432.

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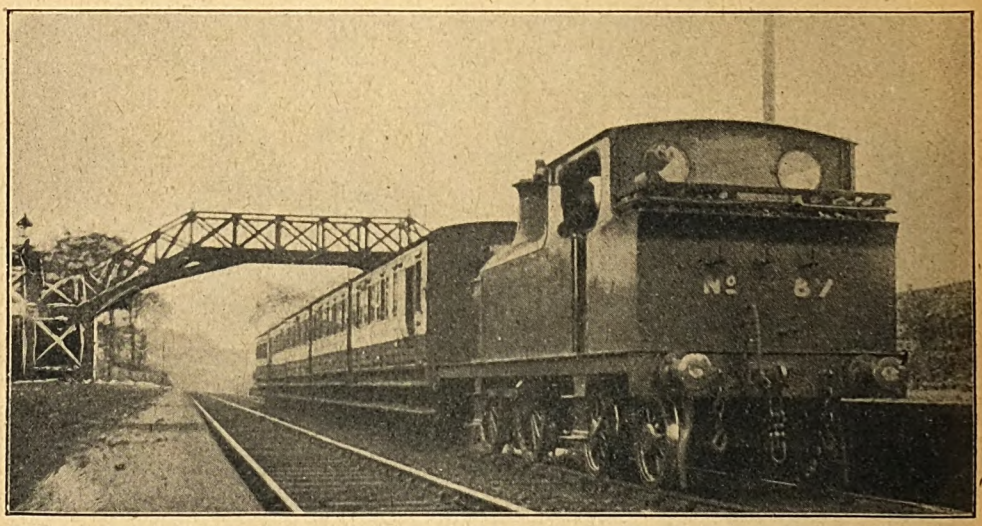
is also interesting to note that the type was still really in its experimental form and had not then been multiplied. Run No. 2, behind *Rising Star*, a 4-cylinder engine, is another example of steady fast work, though the load was lighter. There were two slight checks near Pangbourne, and as the speed at the time was 67 m.p.h., and recovered to 61 after the checks, the loss works out at 2 min. 9 sec., giving a net time to Bath of 103¼ min. The distance of 25 miles between posts 13 and 38 was covered in 22 min. 29 sec., at an average speed of 66½ m.p.h. These two runs are selected to show what high speeds are daily run by the chief expresses on this section. Nothing was said to the driver in either case, nor indeed on any of the runs recorded." As my correspondent rightly remarks, these runs are distinguished rather by careful adherence to schedule times than by any exceptional brilliance, as the loads in both cases were moderate. I have timed similar and higher sustained speeds on similar stretches of line elsewhere in the country, and do not doubt that such speeds would be equally well maintained over longer distances were other lines equally as fortunate as the Great Western Railway in the matter of grading.

The next run—No. 3—is, however, on rather a different footing, as the load was tremendous, consisting as it did of fourteen 8-wheelers, half of which were of 70 ft. stock, and two 12-wheeled dining cars, 68 axles in all. Moreover, as the train was packed from end to end, including people standing in the corridors, I imagine that my friend's estimate of nearly 10 per cent. for passengers and luggage is not extravagant, and this brings the total weight behind the tender to 530 tons. "The travelling ticket collector," my friend remarks, "had not finished his work until we were nearing Chippenham." A speed of 35 m.p.h. had been attained at mile-post 2, of 44 at mile-post 3, of 53 at mile-post 5, of 60 at mile-post 10, and of 65 at mile-post 12, "and we then proceeded," the writer continues, "to cover mile after mile at 68 m.p.h., with the result that the distance of 32 miles between mile-posts 11 and 43 was covered in 28 min. 40 sec. (=67 m.p.h. average), and 60¼ miles were disposed of in the first hour. At the 71st mile-post Croker eased down, so much so that at Swindon we were only doing 45 m.p.h.! On Dauntsey bank the usual check occurred for a small bridge under repair, bringing the speed down to a mere crawl, so that we passed Chippenham 55 sec. late. But with a spurt to 82 m.p.h. at mile-post 105"—assisted by 2 miles down at 1 in 100 and some easier grades beyond—"we were able to stop dead at Bath at 6.6.13," barely ¼-min. after the correct time of arrival.



Photo] [*W. Watt*,

GREAT NORTH OF SCOTLAND RAILWAY.

Local train in Persley station, near Aberdeen.
0-4-4 tank engine No. 87.

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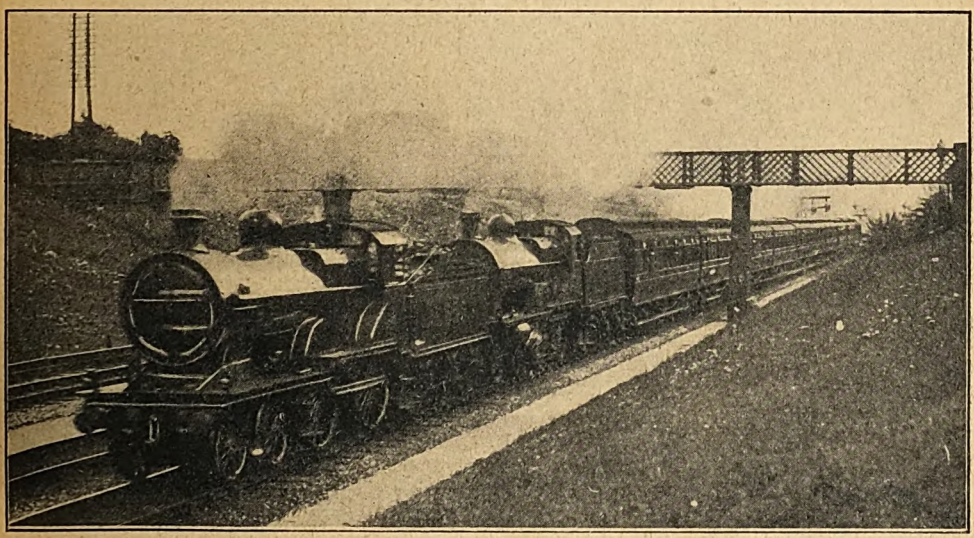
"This seems to me an extraordinarily good performance," my correspondent adds, "when it is remembered that the road from Paddington to Swindon is not really level. Anyone who has taken note of the running on this section will know that however slight the gradient may be, it makes an immense difference in the running of up trains as against down trains. In my earlier experiences the 7 ft. 8 in. singles, working on such trains as the 3.35 p.m. South Wales express, seldom attained 60 m.p.h. at all before passing Swindon, whilst on the up trains they made merry at anything from 65 to 72 m.p.h." Such a difference as this was probably more due to schedules and drivers than to grading, which I fear my correspondent seriously over-estimates, as the total vertical rise between London and Swindon is only the modest trifle of 230 ft. In fact, the only inclination worth mention in this direction is the average of 1 in 750 between mile-posts 53 and 70. Nevertheless this was unquestionably a phenomenal run, in view of the load conveyed.

We come now to the four runs on the Westbury route, which have some equally remarkable features, but I will again let my friend take up his story. "In run No 4, 'Bill' Rowe, with the 2-cylinder engine *Saint George*, and 340 tons, attained a speed of 60 m.p.h. at mile-post 6, and then proceeded to reel off the 23 miles between mile-posts 12 and 35 in 19 min. 43 sec. (= 70 m.p.h.). The service slack at Reading (passed in 9 sec. under even time) was most carefully observed, the mile between mile-posts 36 and 37 taking no less than 2 min. 41 sec.; but speed was quickly regained, and ascending the Kennet valley a steady rate of 62½ m.p.h. was maintained. The lowest speed on the final ascent (2 miles at 1 in 180 and ¾ at 1 in 144) was 53 m.p.h., with the result that the 33 miles between mile-posts 37 and 70, commenced at 30 m.p.h., and entirely uphill at gradients varying mostly from 1 in 600 to 1 in 200, were covered in 32 min. 58 sec. Descending to Westbury 72 m.p.h. was the ruling speed. Having passed through the usual service slacks at Westbury and Frome the Witham bank was taken in fine style, with a minimum of 51 m.p.h. at the extreme summit." Fully a mile of this ascent is at 1 in 107-136.



Photo] [*H. R. H. Ward.*

MIDLAND RAILWAY.

11.30 a.m. down Anglo-Scottish express, near Elstree.
Rebuilt superheater engine No. 555 and compound No. 1028.

My correspondent continues, "I believe Rowe takes his downhill running very steadily, thereby preserving his reputation in the dining car. At any rate we did not exceed 69 in coming down to Castle Cary, though this rate was again maintained for several miles approaching Cogload Junction. There were checks approaching Taunton which caused us to take 11 min. 25 sec. for the 9½ miles on from the 130th mile-post. This reduced the speed in the first instance to 47, and then just afterwards to 45 m.p.h.,

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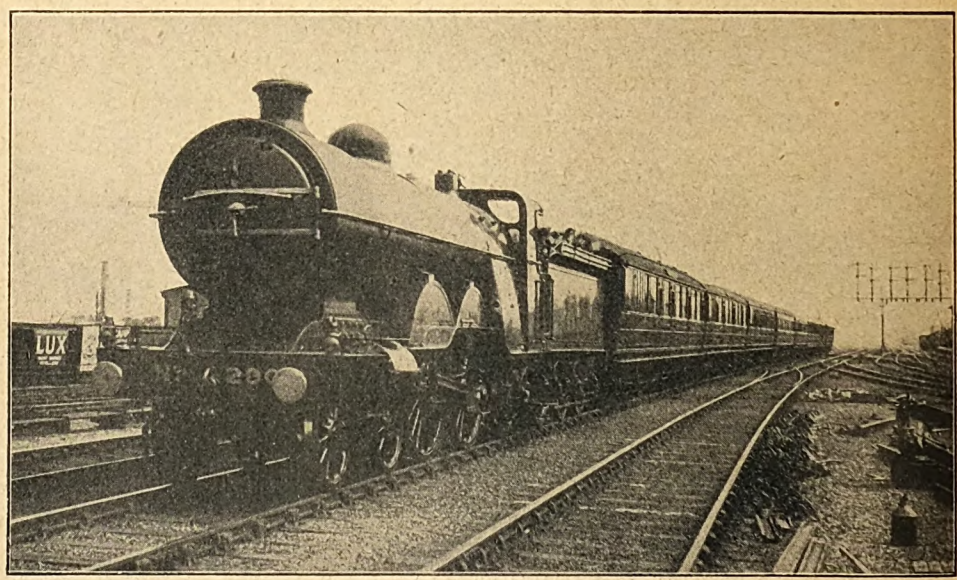
so that the ascent to Whiteball was commenced (mile-post 160 on the old route) at 45 m.p.h., and Taunton was passed at only 54 m.p.h. Still, the mile-a-minute rate was attained at mile-post 166"—although this 6 miles includes 1¼ miles at 1 in 255, 1 at 1 in 330, and ¾ at 1 in 660, and nothing else but level track. "Speed then began to fall gradually, to 56 m.p.h. on the 1 in 210 average grades, 54 after 2 miles mostly about 1 in 165, 45 on the mile at 1 in 90, and finally on the 1 in 81 to 41 m.p.h. The descent into Devonshire was not productive of any very high speeds, 75 m.p.h. being touched twice, just before and after Collumpton. Exeter was passed at 2.59.18, or ¾ min. early, and with a load now reduced to 241 tons we quickly regained speed, and were doing 70 m.p.h. at mile-post 200, 6 miles further on. After the usual service slows at Starcross, Dawlish and Teignmouth. Newton Abbot was passed at 1.52.20. On the banks which follow the lowest speeds were 28 m.p.h. at Dainton (after 2¼ miles at 1 in 97, 57, 47 and 43), and 25 m.p.h. for ¾-mile on the 1 in 51 beyond Totnes. Plymouth was reached comfortably just over a minute before time." No one would deny that this was a run of superlative merit, and Rowe deserves the more credit in that such excellent times were the result of magnificent uphill work, and obtained in spite of most moderate speeds downhill.

"Run No. 5," my friend continues, "was interesting because the train was booked to make special stops at Westbury and Taunton. Starting with a load of 287 tons (40 axles) *Morning Star* attained a speed of 60 m.p.h. at mile-post 5½, and this was increased gradually until 75 m.p.h. was reached at mile-post 20. A bad check at Maidenhead then brought the speed down to 42 m.p.h. When this occurred 12 miles had just been covered in 10 min. 19 sec., at an average of 71 m.p.h., and as a rate of 69 m.p.h. was regained before Reading it seems fair to me to allow here a loss of 3 min. 29 sec." My correspondent then describes the calculations employed to secure this result, which are quite logical, and adds "I know that allowances of this sort are not often warranted, but in this particular case it is quite clear that Finch was making an effort to arrive early at Westbury, and that, had the check not occurred, he might almost certainly have been expected to continue the higher rate of speed. Granting the above allowance, therefore, the net time to Reading was only just over 34½ min. At Reading speed was reduced over the West



Photo] [*W. H. C. Kelland.*

GREAT NORTHERN RAILWAY.

2.20 p.m. down Anglo-Scottish express passing Wood Green.
4–4–2 engine No. 290.

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curve to 30 m.p.h.; the mile following mile-post 36 took 1 min. 45 sec. and the mile-a-minute rate was regained in another 4 miles. Speed then rose to 64½ m.p.h., and remained at this figure for 13 miles, after which, between Newbury and Hungerford, it rose gradually to 67, and so remained for 3 miles." Beyond Newbury there is a slight descent for 1½ miles, which would account for the accelerations, the 3 subsequent miles being on rather easier up grades. "After this the rate fell again to 64½ m.p.h. for another 8 miles, bringing us to mile-post 67, from which the final 3 miles to the summit, respectively at 1 in 180, 180 and 240 (¼) and 144 (¾), occupied 58, 63 and 69 sec. To cover the 33 uphill miles from mile-post 37 (passed at 34 m.p.h.) to mile-post 70 in 32 min. 3 sec. or the 25 miles between mile-posts 43 and 68 in 23 min. 10 sec., even with a net load of only 287 tons, is surely a meritorious piece of work." Further than being meritorious, it is really wonderful, seeing that the aggregate vertical rise between mile-posts 37 and 70 is not less than 360 ft., with no compensating down grades.

"Descending to Westbury 73 m.p.h. was the highest speed. At Westbury, most vexatiously, the signalman kept his home signal at danger so long that the train had practically to start again before entering the station; in this way the last 1¾ miles to the dead stop occupied 3 min. 28 sec. The loss occasioned by the signal delay, coupled with the station stop, as against a clear run through, can be estimated by comparison with my recorded figures in run No. 4. On both occasions the 94th mile-post was passed at 61 m.p.h.; from that point Rowe in run 4 took 2 min. 10 sec. to passing Westbury, attained 51 m.p.h. between Westbury and Frome, and passed Frome in another 8 min. 19 sec. Finch's times were 3 min. 28 sec. and 8 min. 52 sec. respectively, *plus* 1 min. 42 sec. standing at Westbury, and his highest intermediate speed was 49 m.p.h. Subtracting the total of 10 min. 29 sec. in the former case from 14 min. 2 sec. in the latter, therefore, the loss to Finch works out at 3 min. 33 sec., always supposing he continued making his effort, and this he did, as may be seen. The load was now 262 tons, and the ascent past Witham was rather below the general level of the run; 54·5 m.p.h. was attained at mile-post 120½, and sustained up to mile-post 122½, whence the rate fell to 47 at the summit. No excessive speeds were put up on the subsequent favourable section, but we were nearly always doing 68 or 69 m.p.h., until at Curry Rivell relaying brought us down to 22 m.p.h. By a careful study of the mile passing times, in comparison with other runs, I estimate the last-mentioned delay at 3 min. 27 sec. We stopped at Taunton at 6.2.4 and left at 6.3.12 with now only 237 tons, but I calculate the suppositional passing time as 5.50.0. The speeds after Taunton, going by miles, and commencing at mile-post 163, are (m.p.h.) 31, 41, 55; on the 1 in 215—58, 60; on the 165—59, 60, 60; on the 1 in 90—55; on the 1 in 81—48; and the last ¾-mile at 1 in 126 through the tunnel took 67 secs =41 m.p.h. Beyond the tunnel the highest speed was 75 m.p.h., and we drew up at Exeter at 6.36.50. But I make the net arrival time 6.20.38 p.m." My friend's allowances in respect of delays are perfectly reasonable, and the net time of just over 170½ min. for the 173¾ miles' journey—again with moderate downhill speeds—does the driver infinite credit.

"Run No 6," the letter proceeds, "was made on a Sunday, and although two bogies were dropped at Westbury, I think it was excellent work to keep time. At the 2½ mile-post a slight check occurred, but a rate of 60 m.p.h. was attained at mile-post 9½, and speed was ruling generally at 67 m.p.h. (with a maximum of 69 at West Drayton) when at Twyford the train was transferred to the relief lines. The cross-over slack caused a delay of 2 min. 40 sec. and under these conditions we had done well to be through Reading in 38 min. 40 sec. At mile-post 44 the mile-a-minute rate was again attained, but before we could really get going properly, we were checked by Newbury East signals, and put over on to the platform line. This delay amounted to 2 min. 20 sec. We had been 70 sec. late at Reading, and the result of this check was to make us 4 min. late at Savernake, and this in spite of the fact that Morgan made a considerable effort to the summit, maintaining 57 m.p.h. on the first mile up at 1 in 180, 53 on the second, and taking 73 sec. for the last mile, mainly at 1 in 144. The descent beyond Savernake was distinctly quicker than usual, a speed of 72 m.p.h. being quickly attained, and maintained on the easier grades to Patney, followed by a maximum of 82 on the 1 in 222 descent to Lavington. Most unfortunately Lavington home signal was nearly at danger, intense heat following a cold night having stretched the wire while the box was switched out, and a severe reduction of speed here entailed

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a further loss of 90 sec. With the previous delays we were now nearly 6 min. late at Westbury. After passing Frome another very slight check occurred at Witham, costing 15 sec., but this was the end of our troubles, and beyond mile-post 122¾ summit Morgan made such excellent use of the falling gradients that we drew up in Taunton station at 5.15.30, only ½ min. late. A maximum of 80 m.p.h. was attained on Bruton bank, and many succeeding miles were run at speeds approaching 70 m.p.h. The net time to Taunton, 143 miles, was only 143½ min."

"Run No 7 is picked from several records of runs with the up 'Limited' which is, in my opinion, the hardest run on the western sections of the Great Western Railway. We left Exeter 6 min. 50 sec. late, behind *Knight of the Garter*, a 4-cylinder engine, with a load of 361 tons. The ascent to Whiteball was the least satisfactory feature of the run, speed only rising to 56 m.p.h. and then falling to 40 on the final 2¼ miles at 1 in 115 to Whiteball summit. But the subsequent descent was the finest I have ever timed. Thirteen miles from mile-posts 172 to 159 were covered in exactly 9 min. 30 sec., at an average speed of 82·1 m.p.h. The rate of acceleration was very rapid; entering the tunnel at 40 m.p.h., we emerged at 49, were doing 64 at the end of the next mile, 75 at the end of another mile, and 82 after a third. The speed then rose gradually until the ½ mile between posts 167½ and 167 took 20 sec., at 90 m.p.h. We were still doing 86 m.p.h. when we passed Taunton. Over the 'give and take' section beyond Cogload good speeds were maintained, ranging from 69 to 59 m.p.h., and Bruton bank was struck at a speed of 63 m.p.h. The first full mile at 1 in 98 brought the rate down to 58 mp.h.; after 2 miles more (⅝ at 1 in 93, ¼ at 1 in 140, and the rest level) we were doing 51; while the final 1½ miles at 1 in 98 and 1 in 81 reduced us to 41 m.p.h., at which speed we breasted the summit. Descending into Frome 75 m.p.h. was the maximum speed, and the last mile before steam was shut off for Westbury (Frome slack having intervened) took 54 sec. After passing Whiteball 9 min. 34 sec. late, it was obviously useless to hope for a punctual arrival in Paddington, but one could still hope for a 3-hour run. Indeed, we had regained 5 min. on schedule as between Whiteball and Castle Cary, but dropped nearly a minute of this as a result of Frome and Westbury slacks upon so heavy a train."

"After Westbury the running was very good. Having attained a speed of 66 m.p.h. in the first 8 miles (practically level with a faintly upward tendency) the following 6 miles up at 1 in 222 brought us down to 52 m.p.h. But on the succeeding variable upward grades we accelerated to 59, and then, profiting by the brief 1½ miles down at gentle grades just before Pewsey, we actually went up the final ascent to Savernake at a speed of from 60 to 61 m.p.h., although this includes 3½ miles at from 1 in 200 to 270, and an ultimate ¾-mile at 1 in 153. We passed Savernake at 3.40.41, and without further checks we could have been in Paddington, according to my calculations, not more than 3½ min. late. But this was not to be. Just as we had attained 75 m.p.h. the brakes went hard on, and at the 61st mile-post we crawled over a small bridge under repair, thereby losing fully 3 min. 50 sec. The remainder of the descent, so soon as speed had been regained, was at or about 70 m.p.h. Newbury was passed 8 min. 42 sec. late, and Reading 7 min. 18 sec. late. Nork covered the next 33 miles from Reading in 31 min. 48 sec., including the recovery from a speed of 31 m.p.h. at Reading. A dead stop at Royal Oak for 1 min. 40 sec. cost us an inclusive total of 2 min. 20 sec. I think this was a very fine run. The ascent to Whiteball was not exceptional, but the continuous effort afterwards, and the final ascent to Savernake involved high-class work. An actual loss of 2 min. 45 sec. on booked time is obviously more than accounted for by the check at Hungerford, but the net time is 176 min. 35 sec. for the 173¾ miles' journey. In the first hour 59 miles were covered; in the second hour 54½ miles, with Frome, Westbury and Hungerford slacks; and in the next 59 min., 59 miles, inclusive of Reading slack. Between Whiteball and Hungerford 89½ miles were run in 88 min., Frome and Westbury slacks included."

I am sure that no reader—least of all myself—will grudge my friend his enthusiasm over such magnificent running as is displayed on these journeys. I have some equally incomparable gems of my own timing on the same line, which have received publicity in these columns from time to time, and they include certain feats for which I have as yet found no parallel elsewhere. But on the other hand, I have timed feats elsewhere for which I have as yet found no parallel on the Great Western Railway. For instance, I have timed a sustained speed

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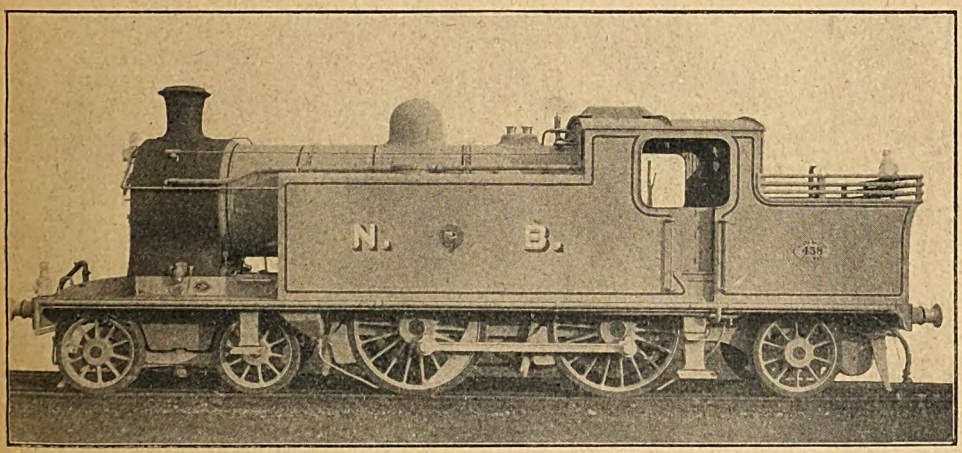
of 80·3 miles per hour behind a North Eastern Railway 4–4–0 engine on a dead level road with no steep preliminary descent, and subsequently 79 m.p.h. at the same spot behind an "Atlantic." On the London and North Western Railway I have noted a 4–4–0 engine to cover 150½ miles of a "give and take" road, with an aggregate rise of 900 ft. and two intermediate service slacks, in 145¾ min. with a load of 410 tons behind the tender. Again, on the same line I have seen a 4–6–0 engine with 310 tons accelerate from a dead start up a continuous ascent of 7 miles, largely at 1 in 133 and 1 in 100, to a speed of all but 50 m.p.h., only falling to 47·4 on the last 2 miles at the latter inclination. A Great Northern "Atlantic" has taken me over 59¾ miles of line, mainly but by no means altogether favourable in grades, in 52 min.—an average of 69 m.p.h.—with 240 tons over a road with a vertical rise of 320 ft. Many other cherished records I might name, but considerations of space forbid, and when the performance of "every train on the Great Western Railway" duplicates all these feats, I shall be ready to subscribe to the most extreme dogma that my friend can formulate.

4-4-2 SUPERHEATER TANK ENGINE: NORTH BRITISH RAILWAY.

Designed by Mr. W. P. Reid, Locomotive Superintendent.

Built by the North British Locomotive Co., Ltd.



In 1912 Mr. W. P. Reid, Locomotive Superintendent, North British Railway, introduced a series of 4–4–2 tank engines for the longer suburban routes and other duties suitable for them. These have rendered good service, but in adding to them Mr. Reid has incorporated superheating apparatus, of the "Robinson" type, and one of these new engines is illustrated.

Boiler pressure is 165 lb. per sq. in. Inside cylinders are 19 in. diam., with a stroke of 26 in., and steam distribution is controlled by inside admission piston valves. Bogie wheels are 3 ft. 6 in. diam., coupled 5 ft. 4 in., and trailing radial wheels 3 ft. 6 in. diam. Rigid wheelbase is 8 ft. 3 in.; total 28 ft. 11½ in. Heating surface is as follows: Tubes, 930 sq. ft.; firebox, 95 sq. ft.; superheater, 220 sq. ft.; total, 1,245 sq. ft. Grate area is 16·6 sq. ft. Westinghouse and hand brakes are fitted to the coupled wheels, while vacuum brake equipment is available for train control when required. Weight in working order is 73 tons 6 cwt., of which 37 tons 7 cwt. are available for adhesion. Carriage heating fittings are also provided. Coal capacity is 203 c. ft., sufficient for about 4½ tons of coal. The side tanks hold 2,080 gallons of water. At 75 per cent. of the boiler pressure the tractive force of the engine is 16,830 lb.

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The Great Western Railway in South Wales.

[No. II.]

By DENIS O'DONOGHUE.

(*Continued from page* 94, *February number.*)

IN Carmarthenshire, Pembrokeshire and Cardiganshire the total railway mileage is much less than that in Monmouthshire and Glamorganshire, although in area the district is larger. The railways of the local Welsh companies do not play the prominent part in south-west Wales that they do in south-east and south-central Wales, and the district is virtually given over to the Great Western Railway. In truth there is little temptation for other railway companies to lay down lines in many of these districts, as the country is sparsely peopled and given over to agricultural pursuits. Were such railways to be built it would be in the nature of a speculation or for the purpose of making more direct communication with other parts of the country. Carmarthenshire with an area a fifth as large again as Glamorganshire has a population not much more than a fifth of Glamorganshire's, and Pembrokeshire, a much larger county than Monmouthshire, has not much more than a fourth of Monmouthshire's population; the population figures of Cardiganshire are even smaller. Monmouthshire and Glamorganshire are the two most thickly populated counties in Wales, their combined population exceeding that of all the rest of Wales.

In forming the complex railway system in south-west Wales numerous local railways have been taken over by the Great Western Company since the absorption of the old South Wales Railway in 1863. The Llanelly Railway & Dock Company was incorporated for the construction of docks at Llanelly in 1828 and authorised in 1835 to make railways. In 1889 this undertaking was amalgamated with the Great Western Railway. The Carmarthen and Cardigan Railway Company, which by 1881 had become hopelessly insolvent, was purchased by the Great Western Company and was wound up that year. The Great Western Company assumed the liability of the Carmarthen and Cardigan Company's debenture stock, and the liquidators were able to distribute about £40 for each £100 of the "A" stock, and a less proportion in respect of "B" and "C" stock.

From Pencader, on the old Carmarthen and Cardigan Railway—which never reached Cardigan!—the line north to Aberystwyth furnishes yet another illustration of a railway enterprise that miscarried. Lying within the county borders of Carmarthen and Cardigan the Manchester and Milford Haven Railway was constructed and owned by an independent company. Its inception was bold, but like many other railway schemes promoted in the year 1846, in which year no less than 272 Acts relating to railways were passed, it was too ambitious for the times, and the idea of connecting Manchester with the then rising port of Milford failed to mature. The intention was to make a railway from Milford to Crewe, which was already in communication by railway with Manchester, and it was hoped that much of the goods traffic then exported from Liverpool would go overland to be shipped at Milford, which at that time had good prospects of development as a first-class port for trans-Atlantic trade.

The Manchester and Milford Haven Company, however, failed to carry out the scheme, and much of the northern area to be served by the proposed railway became occupied by the lines of small companies now vested in the London and North Western and Cambrian Railways. In 1852 an attempt to connect Llanidloes and Milford also failed. Nothing further was done until the construction of the South Wales Railway *viâ* Carmarthen and Haverfordwest. This made possible the opening

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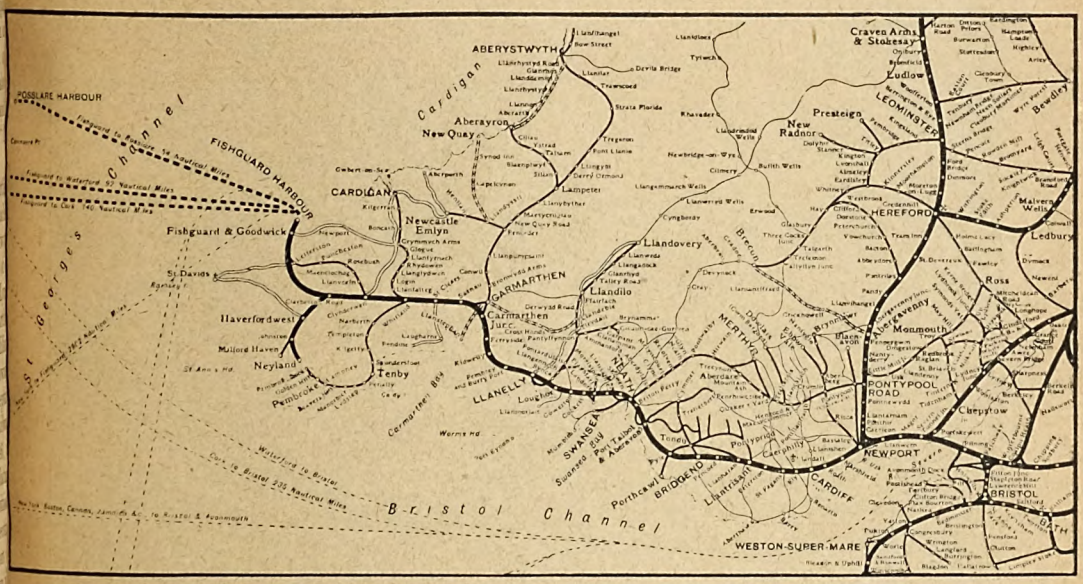
of the local Carmarthen and Cardigan Railway, and this line penetrating into the territory of the Manchester and Milford Haven Company, gave the promoters fresh courage, and in 1860 a new company, with a capital of over half-a-million pounds, was incorporated as the Manchester and Milford Railway Company to construct a railway, 51½ miles in length, from Llanidloes on the Llanidloes and Newtown Railway to Pencader on the Carmarthen and Cardigan Railway.

In 1865 another Act was passed enabling the Company to construct a branch line to Aberystwyth and at the same time conferring running powers over the Carmarthen and Cardigan Railway between Pencader and Carmarthen. In 1866 the first section, about 13 miles, between Pencader and Lampeter was opened for traffic, and the next section, Lampeter to Strata Florida, later in the same year, the branch to Aberystwyth being opened in 1867.

In the meantime great trouble had been experienced with the northern section, which was caused in this manner. The Mid-Wales Company had obtained powers to construct a line between Llanidloes and Brecon, following the same route between Llanidloes and Penpontbren, 2 miles south, and when construction work was about to commence, the remarkable discovery was made that both companies had acquired rights over the same ground, with the result that a complete deadlock ensued. To find a way out of this awkward position the Newtown and Llanidloes Company was approached and induced to agree to make a line 2 miles long from Llanidloes to Penpontbren, for the use of the Manchester and Milford and the Mid Wales Railways, and also to build a station at Llanidloes for the joint use of the three companies, an Act of Parliament sanctioning this being obtained in 1862.

The Manchester and Milford Company after constructing three miles of line between Penpontbren and Llangwrig, abandoned the work, deciding that it was unwise to have two separate railways running through such thinly peopled country, and arranged instead to exercise running powers between Llanidloes and Yspytty Ystwyth, and to make a connecting line from that place to Strata Florida. Financial disaster overtook the Mid Wales Company and the work of making the line south from Llanidloes was stopped. This left the Manchester and Milford Company in a most unhappy position. The Company was liable to the Llanidloes and Newtown Company for its share of the cost and maintenance of the joint station and line at Llanidloes, which incidentally, it could not use, the Manchester and Milford Railway being separated from Llanidloes by about 18 miles of hilly country devoid of railways.

Already in a poor state, the Manchester



SOUTH WALES DISTRICT MAP, GREAT WESTERN RAILWAY.

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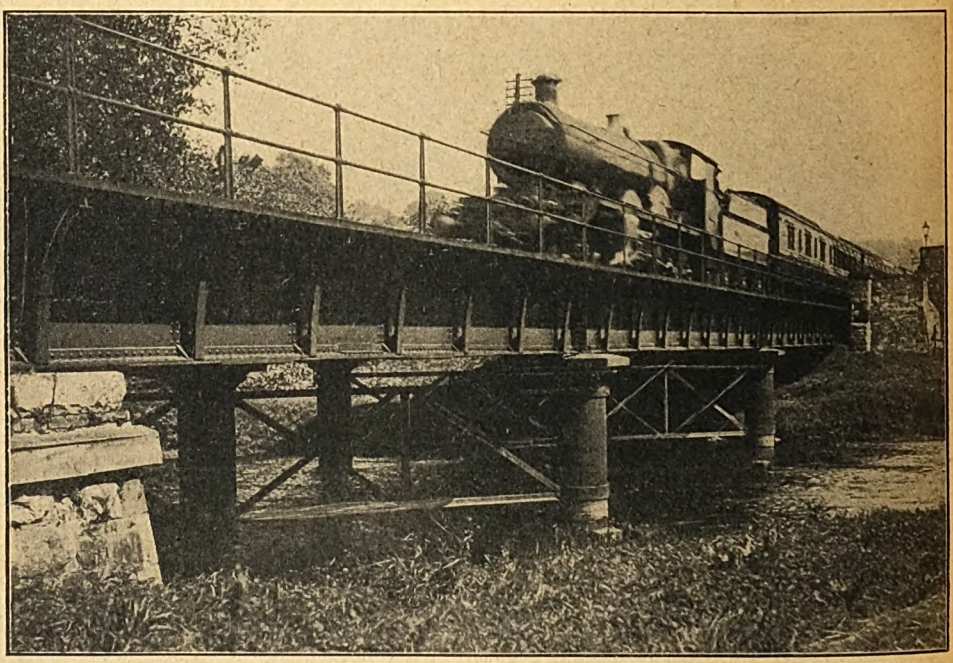
and Milford Company was not able to bear this heavy financial burden. Efforts were made to retrieve its broken fortunes, and in 1873 Parliamentary authority was secured to construct a branch line from Aberystwyth to Devil's Bridge, and build an independent station at Aberystwyth; also to raise £40,000 new capital. But all efforts were unavailing, and in 1880 the proposed railway to Devil's Bridge was abandoned and shortly afterwards the undertaking was placed in the hands of a receiver appointed by the Court of Chancery. In 1905 the Great Western Company entered into an agreement with the Manchester and Milford Company for running powers, but the arrangement was not sanctioned by the Court of Chancery owing to the opposition of the Cambrian Company. The Great Western Company then sought Parliamentary authority to secure a lease of the line and satisfactory arrangements and adjustment of claims having been made with the Cambrian and London and North Western Companies, the Manchester and Milford line passed under the control of the Great Western Company for a period of 999 years, the Cambrian Company having the option of taking over the detached portion of the track between Llanidloes and Llangwrig.

With the exception of the permanent way this section of the line is still intact. The gradients are rather severe, and the earthworks, mainly of a heavy nature, extend beyond Llanwrig village. The line from Pencader to Aberystwyth is a single track, 41½ miles long, and, south of Strata Florida, follows the course of the River Tivy. The line keeps fairly closely for the most part to the natural profile of the country and this entails many heavy gradients and severe curves.



Photo] [*T. Flook.*

PADDINGTON-FISHGUARD EXPRESS PASSING ST. FAGAN'S, NEAR CARDIFF.
4–6–0 four-cylinder engine No. 4039, *Queen Matilda.*

The Whitland and Cardigan Railway was vested in the Great Western Company in 1890, the Great Western Company adopting the debenture stock and rent-charges, and paying a cash sum for the undertakings, original line and extension line. A more important railway to lose its identity was the Pembroke and Tenby Railway. Incorporated in 1859 the Pembroke and Tenby Railway Company was authorised to make railways from Pembroke Dock to Tenby and in 1864 the Company was authorised to construct an extension to Whitland. By Act of 1866 the Company was given authority

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to extend the line to Carmarthen and to Milford Haven, and to make arrangements with the Great Western, Cambrian, Central Wales, Llanelly and Manchester and Milford Railways. In 1870 sanction was given for an extension at Pembroke Dock and for certain arrangements with the Admiralty, also for use of part of the Carmarthen and Cardigan line. Under the provisions of an Act of 1897 the line was amalgamated with the Great Western Railway.

A little railway in which the Great Western Company was interested from the first was the Milford Railway. This Company was incorporated in 1856 for the making of a line from Johnston station to Milford. The Great Western Company rented and worked the line which paid its way until 1896, in which year the original Company was amalgamated with the Great Western Company.

At the time the Great Western Company first seriously contemplated the construction of the necessary works at Fishguard to convert the Bay into a suitable port for cross-channel boats to and from Ireland, railway communication to Fishguard was made by the North Pembrokeshire and Fishguard Railway, incorporated in 1878 as the Rosebush and Fishguard Railway, the change of name taking effect in 1884. This railway was constructed to join the Maenclochog Railway at Rosebush, and the first section was opened in 1895.

The Maenclochog Railway was private property, and was closed for public traffic from 1883 until the time the line from Clynderwen to Fishguard was brought into use. The North Pembrokeshire and Fishguard Railway was vested in the Great Western Company in 1899.

Between Landore (for Swansea) and Carmarthen and the western extremities of the system a good and frequent passenger service is tabled, many of the trains doing the work originating from London. On week-days 13 trains are booked from Landore to Carmarthen, 4 to Neyland and 2 to Fishguard. The numbers of these that emanate from London, or make communication with London trains are 4 for Carmarthen and 2 each for Neyland and Fishguard. Services are given by other trains working between various points on this section of the line.

Photo] [*G.W.Railway.*

GREAT WESTERN RAILWAY TENDER LEAVING THE *Aquitania*.

At Llanelly a branch line runs north to Llandilo, where it meets a section of the London and North Western Railway from Carmarthen. The two railways unite at Llandilo, proceed northwards to Llandovery as a joint Great Western and London and North Western section known as the

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"Vale of Towy line." At one time an independent company, the Vale of Towy line was vested in 1884 jointly in the Great Western and London and North Western Railways. At Llandovery the line joins the London and North Western Company's Central Wales Railway running through the "Wells" country to Craven Arms.

This line is double track from Llanelly as far as Pantyffynnon, 11½ miles, where a single line branch, 6½ miles long, goes east through Garnant to Brynamman, where commences a railway of the Midland Company working south to Swansea. From Garnant on this branch a short single line is laid down to Gwann-cae-Gurwen, a station serving coal pits, and a single line mineral railway to the New Cawdor Colliery. North of Pantyffynnon the branch from Llanelly is single line all the way to Llandovery, over 19 miles; the mineral branch line from Tirydail to Cross Hands, known as the "Mountain Branch," is also single line. The short mineral railway constructed from Llanelly Docks north to Dafen, and the Llanelly and St. David's Junction loop line are also single tracks.

Over the Llanelly, Llandilo and Vale of Towy line the service is rather scanty and of a patchwork description. Four through services are arranged from Llanelly to Llandovery and back, and other trains work from Llanelly to Pantyffynnon and Llanelly to Llandilo, making connections with trains for Llandovery from Pontardulais; similarly, in the opposite way, trains from Llandovery to Pontardulais connect with trains from Llandilo to Llanelly and Pantyffynnon to Llanelly. The service is augmented on Thursdays and Saturdays. On Sundays one passenger train works on the line for post office purposes. In the early morning it runs from Llanelly to Llandilo where it takes an eight hours rest before advancing in the afternoon three stations further up the branch to Llangadock, where it halts for a few minutes only and then hurries back to Llanelly.

On the Brynamman branch 6 trains work each way between Pantyffynnon and Brynamman with extra late trains on Thursdays and Saturdays; there is no Sunday service. From Garnant to Gwann-cae-Gurwen, between which stations the speed is restricted to 10 miles an hour, a rail motor car, one class only, makes nine trips in each direction on week-days only, with additional trips on Thursdays and Saturdays.

At Carmarthen, 20½ miles from Llanelly, the single line branch of the old Carmarthen and Cardigan Railway runs north about 14¾ miles to Pencader, there turning west to Newcastle Emlyn in the company of the River Tify. Between Carmarthen and Newcastle Emlyn four services are supported in each direction on week-days, plus one extra between Pencader and Newcastle Emlyn. Over the old Manchester and Milford Railway between Aberystwyth and Pencader 4 passenger trains work in each direction on week-days and through carriages for Aberystwyth, which station is used jointly by the Great Western and Cambrian Railways, travel over this route from London attached to the morning South Wales express.

From Lampeter, 12¾ miles north of Pencader, a light railway, 13½ miles long is laid down to Aberayron. The Lampeter, Aberayron and New Quay Light Railway was incorporated by order of the Light Railway Commissioners, confirmed by the Board of Trade in 1906, for the construction of a light railway from Lampeter to Aberayron and New Quay, 21 miles in length, with the standard gauge of 4 ft. 8½ in. The work of construction commenced in 1908 and the line to Aberayron was opened for traffic in 1911. The Great Western Railway works the line and maintains 4 passenger services in each direction on week-days by one-class car

Outside Carmarthen, on the branch, at Abergwili Junction, the London and North Western Company's railway from Llandilo joins the Great Western line, and running powers are possessed by the London and North Western Company between the Junction and Carmarthen.

(*To be continued.*)

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A "Mathematical" Timetable.

New Electric Suburban Train Services: London and South Western Railway.

POSTPONED from December 6th last year, on Sunday, January 30th, electric trains commenced to work the Kingston "roundabout" and Shepperton routes; and at the same time the London and South Western Railway introduced entirely remodelled train services in the suburban area, affecting many steam trains as well as the electrically operated routes.

The public timetable also appeared in a new cover, breaking away entirely from old traditions. Instead of the not very artistic green cover, with coat of arms in the centre, a neat art-brown shade is utilised for ground, the front bearing only the words "London and South Western Railway Timetables" in white characters cased in black, the duration of the services in black, and the name of Sir Herbert Walker, General Manager, in white. The back cover utilises the now characteristic design coupled with the intimation, "The quickest way ''Twixt Home and City,'" worked in white and black on a brown ground.

Internally, too, the tables are remodelled, realising relative simplicity for what is really a complicated system, and facilitating reference, many of the sections being sectionalised according to more convenient methods.

A further feature of interest is that passengers are taken into confidence in reference to the head-codes borne by the electric trains. Apparently it is not considered desirable to introduce destination boards, these being placed on the sides of vehicles only according to the system hitherto adopted; but as the identification letters in front of electric trains become generally known, they will certainly assist regular travellers very materially.

A large poster has been issued, and a reproduction is now given. It is printed in art brown and green. The electric train is green, and this policy is adopted on other posters and in literature with a view to familiarising the public with the fact that the electric trains are painted in this colour.

The letter V in the top left-hand corner is borne by "roundabout" trains on the section between Waterloo and Teddington *viâ* Wimbledon and Kingston. Beyond Teddington, for the route through Richmond, a stroke is added, as shown in the top right-hand corner. The necessary alteration will usually be made at Teddington. Shepperton trains *viâ* Kingston carry the letter "S," and in the case of trains to and from Shepperton running *viâ* Richmond the stroke will be added, as in the case of "V" trains. There are, at present, none of these, except that the Sunday locals run between Twickenham and Shepperton; but they will, no doubt, be added in due course. "P" trains are those already running on the Southfields-Wimbledon service.

Primarily these indications are for signalling purposes; but it is a good plan to instruct the public on the subject, as regular travellers, at least, will soon be able to distinguish the respective trains. During daylight the letters appear in large white characters in the centre panels of the coach ends; at night they are similarly shown in illuminated characters. Other letters will be added in due course, as further routes are electrified.

The main feature of the new train services, apart from the accelerations and additional facilities given—an exceedingly important matter, as will be seen—is the "mathematical" character of the schedules. So systematic is this, that the accompanying diagrams set forth virtually the whole of the train services concerned. In fact, although a few notes are necessary to amplify those relating to the electric routes, these are really only required to cover the early morning and late evening trains, which are naturally of a varied character and include many working into or out of service at intermediate stations. In regard to the Kingston and Shepperton trains these are exclusively electric except for a few steam trains during the early morning hours, when the electric system is shut down, and two or three special Shepperton trains *viâ* Richmond, mostly fasts to meet the requirements of residential travel.

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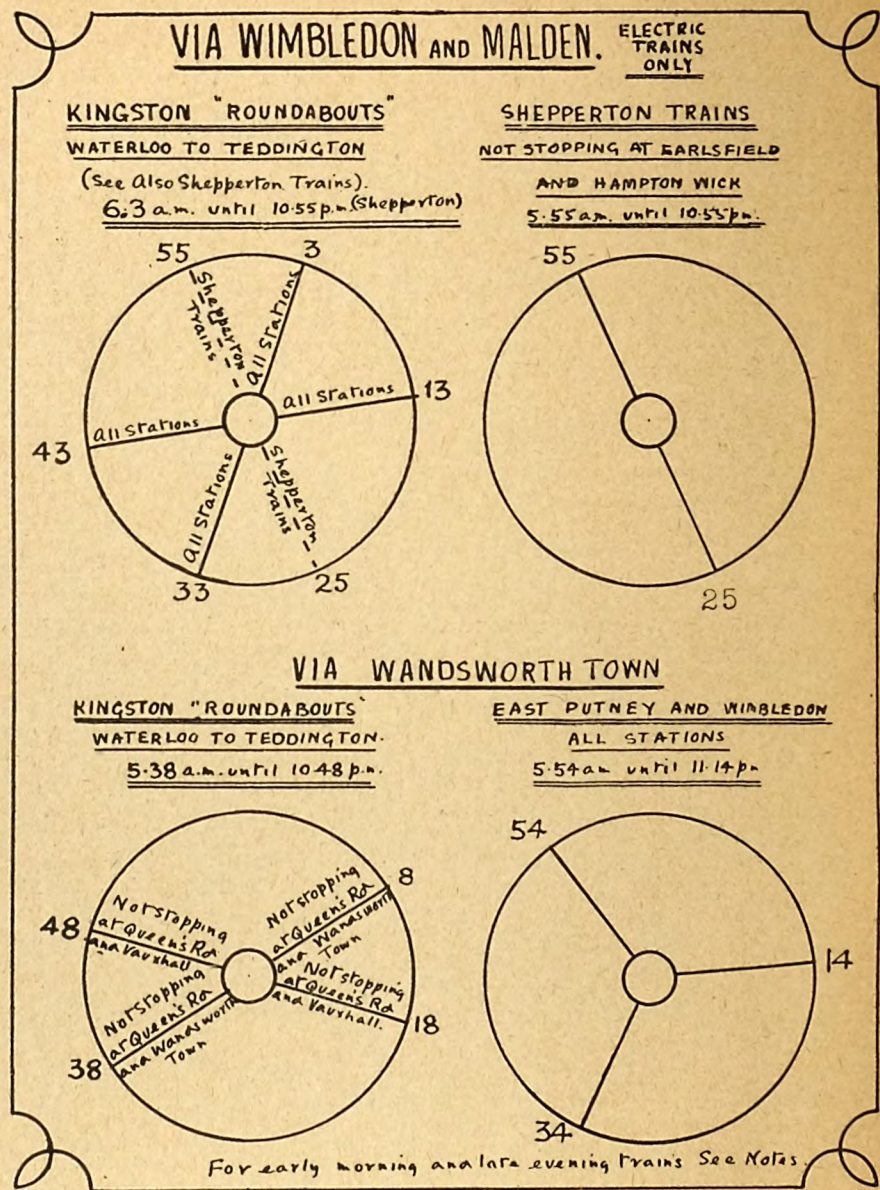

DIAGRAMS SHOWING SYSTEMATIC ARRANGEMENT OF TIMETABLES FOR NEW ELECTRIC SERVICES.

NOTES.

Kingston "Roundabouts" viâ Wimbledon.—Steam trains at 1.15 (to Kingston), and 2.30 (to Teddington) a.m. Electric trains at 3.53, 5.3, 5.33 and 5.55 a.m., with services from Wimbledon, taking up standard times, at 4.29, 4.59, 5.9, 5.29 and 5.59 a.m. After 11.0 p.m. trains run at 11.13, 11.33, 11.53 p.m., 12.13 and 12.33 a.m.

Shepperton trains.—From Wimbledon at 5.9 a.m. After 10.55 p.m. at 11.53 p.m. All stations.

Kingston "Roundabouts" viâ Richmond.—Early trains at 1.48 and 2.45 a.m. (steam), and 5.5 a.m. (all stations). Late trains at 11.18, 11.38, 11.55 p.m. and 12.15 and 12.45 a.m.

Southfields and Wimbledon.—Late down trains at 11.34 p.m. and 12.20 a.m. (to Wimbledon Park only).

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A series of diagrams have been prepared to set forth the systematic character of the new services. Thus between Waterloo and Kingston *viâ* Wimbledon the diagram applies without variation from 6.3 a.m. until 10.55 p.m.; on the Shepperton route (*viâ* Wimbledon instead of *viâ* Richmond as heretofore) from 5.55 a.m. until 10.55 p.m.; for Teddington *viâ* Richmond from 5.38 a.m. until 10.48 p.m.; and on the East Putney and Wimbledon route from 5.54 a.m. until 11.14 p.m.

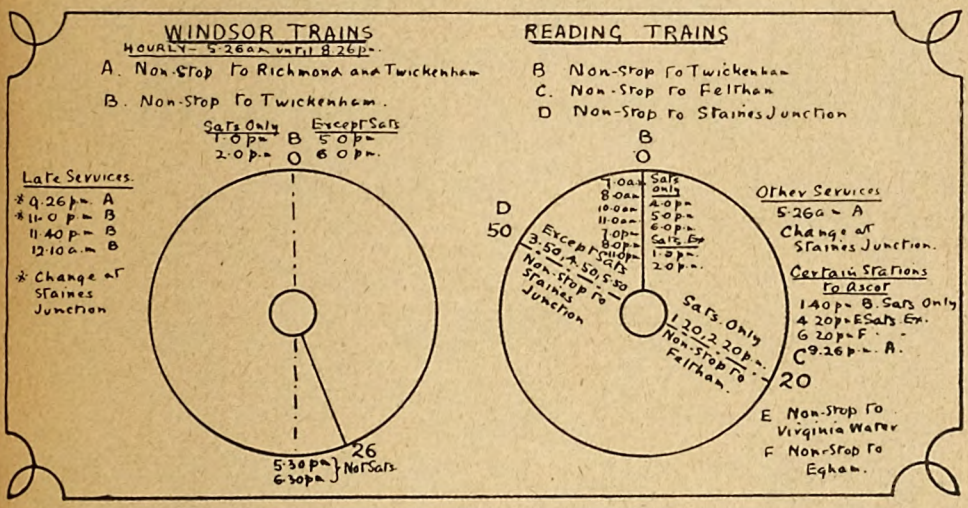
Standard times, with a corresponding example from the steam services displaced and applying to the Waterloo, Wimbledon, Kingston, Teddington section, are as follows:

Electric Schedules (each hour).							*Steam Schedules.*	
Waterloo..	.3	.13	.25	.33	.43	.55	8.33	9.10
Vauxhall	.6	.16	.28	.36	.46	.58	8.38	..
Clapham Jn..	.11	.21	.33	.41	.51	.3	8.44	9.21
Earlsfield	.15	.25	..	.45	.55	..	8.49	..
Wimbledon	.19	.29	.39	.49	.59	.9	8.54	9.29
Raynes Park.	.22	.32	.42	.52	.2	.12	8.58	9.33
Malden ..	.25	.35	.45	.55	.5	.15	9.2	9.37
Norbiton..	.29	.39	.49	.59	.9	.19	9.6	9.41
Kingston..	.31	.41	.51	.1	.11	.21	9.8 9.13	9.43 9.48
H'mpt'n Wk.	.34	.44	..	.4	.14	..	9.16	9.51
Teddington	.37	.47	.55	.7	.17	.25	9.20	9.55

Of these 10-min. trains those at 25 and 55 min. past each hour proceed on to the Shepperton route, and are interesting because of their passing Earlsfield, so that at Wimbledon, though starting 2 min. later in comparison, they take up the standard running. They also omit Hampton Wick, gaining another 2 min. to Teddington, after which they diverge to the Shepperton route.

A stopping steam train took about 35 min to Kingston, while the time is now 28 min. In fact, it was only the few fast trains which improved on this, and then only by a very few minutes. The change is further remarkable, in that the standard 10-min. service replaces an irregular one which involved many "hour intervals." A 40 min. average interval may be taken as an approximate estimate, erring rather on the generous side; so that the ample service now given represents a veritable transformation. A noteworthy feature, too, is that not a single electric train is noted as running on "Saturdays only," or "Except Saturdays," and there are no variations from the standard arrangements noted above, except in the early morning and late evening. Variations in requirements are entirely met by using three or six-coach electric trains as required. Moreover, although there are trains on other routes serving stations between Waterloo and Malden, there are none beyond the electrics through Kingston.

In the opposite direction arrangements exactly correspond. The Shepperton trains leave at 17 and 47 min. past each hour, and they pass Hampton Wick, fitting in at Kingston to form the 10-min. service at 7, 17, 27, 37, 47, and 57 min. past each hour. Arrivals at Waterloo are at 4, 16, 26, 34, 46 and 56 min. past each hour, those at 4 and 34 being the Shepperton trains which pass Earlsfield and thus gain 2 min. on the stopping schedule.



DIAGRAMS SHOWING NEW WINDSOR AND READING ROUTE TRAINS.

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On Sundays there is a half-hourly service at 22 and 52 min. past each hour from Waterloo, comparing with a previous hourly service, and all trains this way are kept to the roundabout route, the Shepperton route being served *viâ* Twickenham.

On the Richmond route the electric services at present apply to the completions of the four roundabout services left after the diversion of the Shepperton trains above portions of this route, fast, semi-fast, and slow, and including those *viâ* the Hounslow loop and the Southfields and Wimbledon electric trains already in service, the result is to give the full facilities required by stations involved. This explains, too, why all electric trains are semi-fast. One or two of the early morning trains call at Queen's Road, but otherwise the electric "roundabouts" either pass Vauxhall and call at

REPRODUCTION OF POSTER ISSUED IN CONNECTION WITH NEW ELECTRIC TRAIN SERVICES, GIVING "HEAD CODES."

noted from the 10-min. service.

	Electric.				Steam.	
Waterloo	.8	.18	.38	.48	8.57	10.25
Vauxhall	.11	..	.41	..	..	10.30
Queen's Road	..	..	..	..	..	..
Clapham Junction	.16	.24	.46	.54	9.7	10.37
Wandsworth Town ..	.27	..	.57		..	10.41
Putney	.20	.30	.50	.0	9.13	10.45
Barnes	.23	.33	.53	.3	9.17	10.49
Mortlake	.26	.36	.56	.6	9.21	10.53
Richmond.. ..	.30	.40	.0	.10	9.26	10.59
St. Margaret's ..	.32	.42	.2	.12	9.30	11.3
Twickenham ..	.35	.45	.5	.15	9.32	11.6
Strawberry Hill ..	.37	.47	.7	.17	9.33	11.10
Teddington ..	.40	.50	.10	.30	9.37	11.14

There are numerous other trains on Wandsworth Town, or call at the former and pass the latter, giving a systematic service from Putney onwards. On Sundays the service is half-hourly, continuing the trains *viâ* Malden already noted, and the Shepperton route is served by local trains connecting with the "roundabouts," or with other trains, at Twickenham.

This completes the electric services so far ready, but electric trains will commence on the Hounslow loop line on February 27th. Details are not available as we go to press. But there are important changes in other respects which call for reference.

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Thus on the longer Windsor and Reading services there are now quite a number of trains fast from Waterloo to Twickenham in 20 min., and these are now run at relatively regular intervals, usually at the even hour. Another regular series is at 26 min. past the hour, fast to Richmond and Twickenham. Speaking generally, it is the Reading trains which are fast to Twickenham, and the Windsor trains fast to Richmond, the former including the even-hour trains noted, except that on Saturday afternoons, or alternatively on other week-days during the early evening, some of the Reading trains, or trains to Virginia Water, etc., are put back to 20 min. past the hour, and certain Windsor trains take the even-hour run, non-stop to Twickenham. Thus there are trains fast to Feltham on Saturdays at 1.20, 2.20, and on other days at 3.50 (fast to Staines Junction), 4.20 (fast to Virginia Water, thence to Woking), 4.50 (fast to Staines), 5.50 (fast to Staines), and 6.20 p.m. (fast to Egham, thence to Woking). The Windsor trains are run regularly every hour, the 26 min. schedule being a standard one from 5.26 a.m. until 9.26 p.m. The last-mentioned runs to Ascot and gives a Windsor connection from Staines, while a similar connection is given off the 11 p.m. Reading train. The 11.40 p.m. and 12.10 a.m. Twickenham non-stops are both Windsor trains. On Saturdays, however, the 1 p.m. becomes a Windsor train, the Reading following at 1.20 p.m., the same occurring at 2 p.m., while on other days certain trains, such as the 5.30 p.m. Twickenham non-stop, replace a 5.26 p.m. calling at Richmond, as regards the Windsor route. On Sundays the usual departure is at 5 min. past the hour, generally, however, at 2 hour intervals, most of these being Windsor trains, with one or two connections on the Reading route, many trains being in the way of extras. A timetable note is included in the tables to the effect that Staines High Street station is "Closed for the period of the war," instead of being stated in a footnote or otherwise as usual.

Remaining trains on the Windsor line section are usually the extras, and it may be noted incidentally that the two 20 min. intervals between the electric roundabout trains are useful for the fast schedules, such as those noted. At business hours there are several other steam trains, usually fast, to serve Mortlake, Richmond, St. Margarets, and Twickenham, and the fasts for the Shepperton route, which continues to obtain its best services this way. As regards other routes, there are indications of important changes, but final results will only be revealed when they are ready for electrification. During morning hours a number of Hampton Court trains are run systematically at the half-hour, and later in the day several instances of 7 and 37 min. regular schedules are indicated. *Viâ* Leatherhead several trains leave at the even hour, and *viâ* Oxshott at 20 min. past. There are also certain trains at 38 min. for main line stations. These arrangements are, however, at present somewhat irregular, and cannot be stated so precisely as in the case of other services. There are, of course, extras at business hours, but these need not be analysed, except that, as already noted, there are now none to the Kingston route, where the full electric service is available. On Sundays the local trains are slower, as they have to amplify the half-hourly electric services for intermediate stations.

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The Internal-Combustion Motor as a Factor in Railway Traction.

REFERENCE has been made on several occasions to developments in traction on railways wherein an internal combustion engine is utilised. Such applications include direct propulsion by such motors, usually with the interposition of gear boxes; the "petrol-electric" system wherein the explosive engine drives a dynamo generating current for electric traction motors, the equipment forming in effect a self-contained electric traction installation; and a petrol-hydraulic system according to which hydraulic power, provided by means of an internal combustion engine operating pumps, is used for driving.

PETROL-HYDRAULIC RAILWAY CAR SUPPLIED TO A CANADIAN RAILWAY.

The two former applications are now well known, and a great deal is now heard concerning petrol-electric methods of traction. But other methods of double-transmission are also available, as shown by the petrol-hydraulic equipment now described. The motor car illustrated is one supplied to a light railway under construction in Canada, the Lacombe and Blindman Valley Railway, extending from Lacombe to Rimby, Alberta. The builders were, however, an English firm, Messrs. McEwan, Pratt & Co., of 13, South Place, London, E.C.

The car embodies the feature of a semi-direct drive, weighs 20 tons, is 33 ft. long overall, and 8¼ ft. wide overall. The truck centres are 18 ft., and the wheelbase of the truck wheels 5½ ft. The seating capacity is 36, provided in rattan covered cross seats, with a central aisle.

Power transmission is on the Hele Shaw system, wherein a variable stroke oil pump, directly driven by an engine, forces oil through pipes to an oil motor, which in turn, drives the axles of the car. The power of the driving engine is thus converted into movement of oil under pressure, and as the quantity of oil pumped is variable through the variable stroke pump, the speed of the oil motor, which is directly dependent on the quantity of oil delivered to it, can be directly regulated.

By a suitable movement of the control spindle, the direction of flow of the oil, and therefore the direction of motion of the motor, may be reversed at will. It will thus be seen that the oil motor rotates at a speed directly proportional to the amount of oil it receives, its speed being varied and reversed at will. Likewise, when the pump is at full stroke, it is delivering a large amount of oil at moderate pressure, but when the stroke is reduced, the same power in the motor delivering a smaller amount of oil, will deliver it at a higher pressure, giving a

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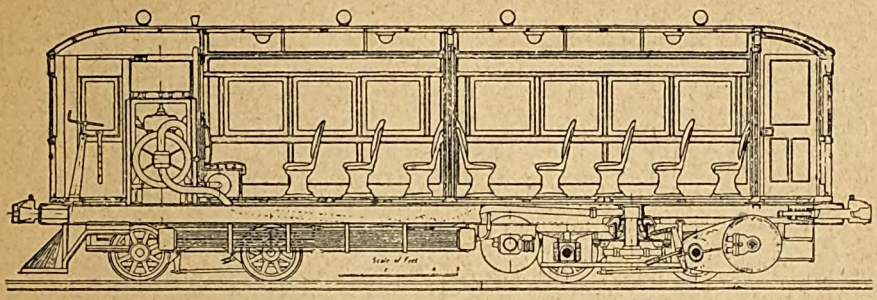


DIAGRAM SHOWING PETROL-HYDRAULIC RAILWAY CAR.

greater effort at the motor, or a high initial starting torque.

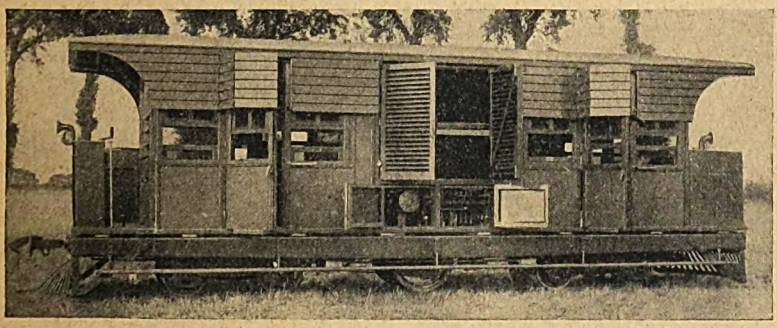
The motor driving the pumps is a 6-cylinder engine, with cylinders 140 by 156 mm., designed to give 103 b.h.p. at 1,510 r.p.m. on gasoline and 85 b.h.p. on oil. This engine is situated across a front compartment of the car, and is operated from that end only, by the operator, who is situated directly in front of the engine. Directly connected to the engine shaft, is the variable stroke pump mentioned. In it, oil is the working fluid. This pump has a fixed outer cylindrical casing, and an internal rotating part carrying the radial cylinders in which the plungers reciprocate.

Inside the fixed casing, there is a guide frame, which is normally and when the pump is running idle, concentric with the outer casing and cylinder body. In this guide frame is cut a circular guide channel, and the plungers are connected to this by slipper blocks. As soon as the guide frame is moved in either direction so that its centre becomes eccentric to the outer casing, the plungers are caused to reciprocate in the cylinders, the amount of stroke varying with the amount of eccentricity.

Oil is drawn in and discharged through the hollow central shaft, around which the plungers rotate. The special feature of the pump is that its capacity and direction in which it forces the oil can be varied at will by simply altering the position of the guide frame.

Oil under a pressure of upwards of 2,000 lbs. per sq. in., is transmitted from the central shaft of the pump, through a heavy steel pipe, to the two hydraulic motors on the rear truck. The oil is delivered from the transmission pipe to the piping of the rear truck through an arrangement of packed valve in the centre pin connection of the truck to the underframe. The motors are situated front and rear of the truck, and connect with the truck axles through heavy chain gearing.

As the hydraulic fluid used is ordinary lubricating oil, the claim is made that all the working parts are thus perfectly lubricated, reducing wear to a minimum. There are no piston rings, packing or parts, requiring renewal, and any oil that may leak past the plungers of the pump or motors, is returned to the system by means of a small auxiliary pump. Safety valves



PETROL CAR FOR THE RAO OF CUTCH, INDIA. LIGHT RAILWAY, 2 FT. 6 IN. GAUGE.
Messrs. McEwan, Pratt & Co.

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are fitted on the pipe system, so that if any undue stress is thrown on the gear, the pressure is relieved automatically, and the risk of breakage obviated. There is also a by-pass for the oil, actuated automatically by means of an air cylinder when the air brakes are applied, thus preventing damage to the hydraulic motors.

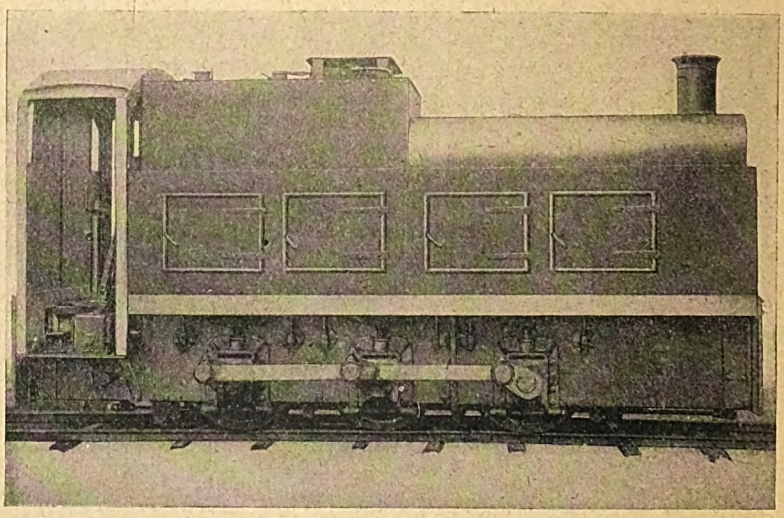
It will be seen that the oil motor rotates at a speed directly proportional to the amount of oil it receives, its speed being varied and reversed at will. Further, that when the pump is at full stroke it is delivering a large amount of oil with moderate pressure, but that when the pump is reduced in stroke, the same horse power is able to produce a higher oil pressure, and thus give a greater effort on the motor, although, of course, the stroke of the pump and quantity of oil delivered is less. At a very small stroke a very high oil pressure will give almost unlimited starting effort without any additional horse power being required.

The advantages over the ordinary gear box are that instead of three or four fixed ratios an infinite range of gear variations is obtainable, and the exact gear ratio can be selected under any conditions to give the best results. When starting up a maximum torque is obtainable and no time is wasted in changing gear, as the gear ratio is increased and decreased gradually. Safety valves are fitted on the pipe system, so that it is impossible to overstrain the gear.

The control is of so simple a nature that the gear may be placed in the hands of anybody.

This gear is entirely mechanical. There is nothing either in the construction of the gear itself, or in the control, with which the ordinary mechanic is not familiar. It has the great advantage of being self-lubricating, and with little or no tendency to wear out, being practically dust-proof. All that is required by way of attention is the occasional addition of a small quantity of oil.

The engine is controlled automatically by the operation of the hand wheel, which actuates the pump, effecting the opening and closing of the pump throttle. The makers are also building a locomotive operating on the same system.



SIX-COUPLED PETROL LOCOMOTIVE FOR HEAVY SHUNTING DUTIES.
Messrs. McEwan, Pratt & Co.

While referring to the work of this firm mention may also be made of their work with internal combustion engines giving direct drive. It is sometimes stated that the explosive motor thus applied has no future before it, or that its capabilities are only sufficient, in railway applications at least, for small, or at the utmost medium, demands. Be that as it may, though the matter is a debatable one, Messrs. McEwan, Pratt & Co. have equipped quite a number of interesting rail cars operating in this way, and also supply internal-combustion locomotives for local shunting and like service; and in these applications undoubted practical and economic success has been realised.

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An illustration is included of a neat car built for an Indian light railway of 2 ft. 6 in. gauge, and specially designed for H.H. The Rao of Cutch. This will accommodate 12 persons and can be controlled from either end. Internally the upholstering is in buffalo hide and electric light is fitted throughout. The coach work is designed to suit climatic conditions in India. This car is often used for hunting expeditions.

The engine is of four-cylinder, four cycle type, 4 in. bore, 5 in. stroke, giving 20 to 24 h.p. Ignition is high-tension magneto; and clutch of multiple disc type. The gear box is of substantial design, giving three speeds in either direction, thence from sprockets to cushioned chain wheels on driving axle by two roller chains. The two driving wheels, flangeless, are fitted in centre of car, with all machinery on separate bearers. One-third of the total weight of the car is carried on the "drivers" by long and flexible helical springs. A four-wheel swing bogie at each end makes the car very easy riding.

As regards locomotives, these are made of various usual types for lighter duties, and in special forms, as for use underground in mine application. An illustration is reproduced of a fairly large machine adapted to meet considerable demands. As will be seen, it has six-coupled wheels, and is suitable for shunting purposes in dockyards, factory sidings, or on extensive plantations involving relatively heavy requirements.

It is fitted with a four cylinder engine of heavy design, 8 in. bore, 10 in. stroke, giving from 80–100 h.p. A two-cylinder 10 h.p. barring engine is fitted for starting up. Ignition is on the dual system high-tension magneto and accumulator, and the clutch of multiple disc type.

The gear box is of extra heavy build, giving two speeds in either direction, thence by two roller chains from sprockets to spring chain wheels on driving axle.

A pump circulating water for cooling continuously through the cylinder jackets and radiators. A make-up tank automatically keeps the water system fully charged. Fuel and water tanks of ample proportions.

April "Railway Magazine" Frontispiece

will be a colour reproduction of a magnificent oil painting illustrating a

LONDON & NORTH WESTERN RAILWAY TRAIN

travelling at full speed.

Price of Magazine, 6d., as usual. Order Early.

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ELECTRIC SHUNTING LOCOMOTIVE: MIDLAND RAILWAY.

MR. J. F. GAIRNS in the April, 1914, RAILWAY MAGAZINE, dealing with Derby Locomotive Works, Midland Railway, mentioned an electric accumulator locomotive built to replace horse haulage in an awkward portion of a yard in the West India Docks, London. This engine has fully justified itself, and we are now able to illustrate it. Usual speed is 7 miles per hour, and the rated capacity is 6 loaded 15-ton wagons, or 12 empty wagons. Weight is 17½ tons, and wheelbase is 8 ft. 6 in. There are two 22 horse-power motors. A most important feature is the battery, of 108 cells, 21-plate T.L. type, capacity 300 ampere hours, supplied by the "D.P." Battery Company, Ltd., of Bakewell, to which firm we are indebted for the illustration. The batteries are charged from a motor-generator taking current from the Poplar Borough Council's supply.

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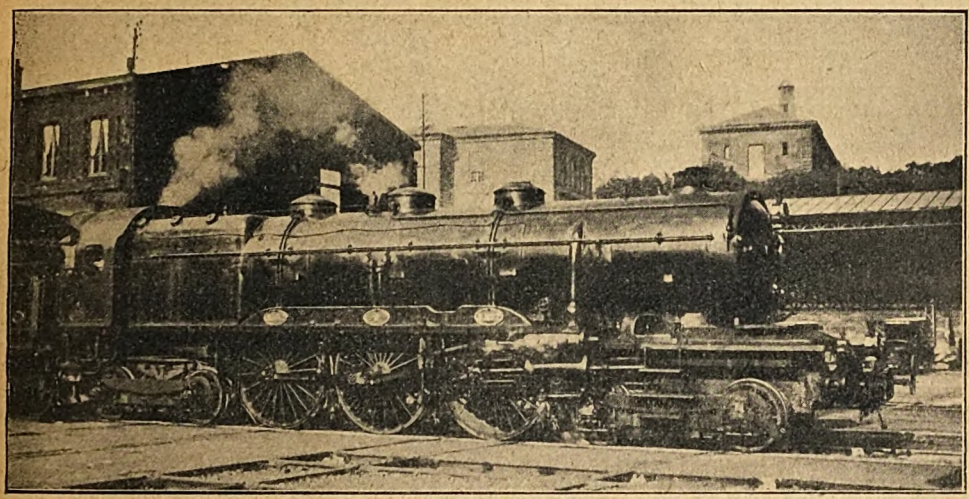
Camera Studies on French Railways.

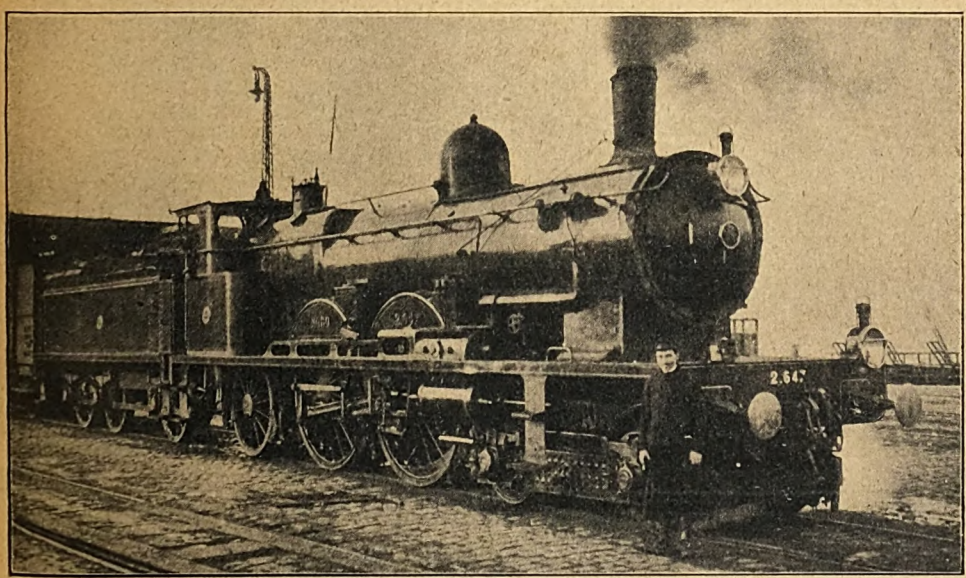


Photo] [*W. H. C. Kelland.*

NORTHERN RAILWAY OF FRANCE.

4–6–4 engine No. 3.1102, on Boat train, at the Gare du Nord, Paris.

We are indebted to Mr. W. H. C. Kelland, and Mr. H. Macartney Robbins for a fine series of photographs of trains and locomotives in service on Continental railways. One forms the frontispiece for this number of the RAILWAY MAGAZINE, showing a Northern Railway of France (C. de Fer du Nord) 2–8–0 engine hauling a long passenger train, while on this page two other photographs are reproduced. Both apply to the same railway, the upper one illustrating one of the "Baltics" on a boat express at the Gare du Nord, Paris. The other represents one of the famous "Atlantics" on the Quay at Boulogne, the engine being, however, fitted with superheating appliances.



Photo] [*W. H. C. Kelland.*

NORTHERN RAILWAY OF FRANCE.

4–4–2 engine No. 2.647, fitted with Schmidt superheater, on the Quay at Boulogne.

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PERTINENT PARAGRAPHS

Magazines for the Fighting Forces.

To the appeal by the Postmaster General for books and magazines to be sent to soldiers and sailors by organisations approved by the War Office and the Admiralty the response has been encouraging. About 1,400 bags, representing about 140,000 items of literature, are being sent each week, but there is still a great shortage, as 250,000 a week are required.

All RAILWAY MAGAZINE readers are earnestly requested to hand in at any Post Office in Great Britain and Ireland all the magazines, not more than twelve months old, they can spare. No postage need be paid, and no wrapping is required.

There are over 130,000 men in the British Army and Navy who in civil life were in railway employment, to say nothing of the many thousands of gallant fellows in the fighting forces who take an enthusiastic interest in railway and locomotive subjects, although never actually engaged in railway work themselves. Letters continually arrive at the RAILWAY MAGAZINE offices telling of the real deprivation these men feel when unable to obtain their favourite magazine while on foreign service or in hospital. These communications are far too numerous and lengthy to quote, but for the benefit of some who may not like the Post Office scheme and prefer to send direct, an exception may be made for one from Lance-Corporal H. J. Smith, R.A.M.C., Kasr-el-Aini Hospital, Cairo, who writes :—" I should be much obliged if some kind reader would forward me any old copies of the magazine. I used to be a regular reader of your fine paper and miss the interesting articles. After reading them myself I would pass them on to patients in the hospital." May we once more appeal to RAILWAY MAGAZINE readers to each and all do something to meet the wants of fellow railway enthusiasts now serving their King and Country in the foreign field ?

The 1915 Annual Reports.

FIRST of the larger companies to come to hand is the report of the Taff Vale Railway for 1915. This indicates the main features which differentiate those of 1915 from those for the previous year. In introduction the Directors state that the control of the Company's railway is still in the hands of the Government, and that the Executive Committee of General Managers of certain Companies, with the President of the Board of Trade as Chairman, continues to direct the operations of the entire railway system of the country. They then point out that the mode of assessing the compensation payable by the Government, as set out in the last report, continues in force, with the exception that the provi o that the aggregate net receipts were to be reduced in proportion to the amount by which the aggregate net receipts of the first half of 1914 were less than those of the first half of 1913, has been withdrawn, in consideration of an undertaking by the Companies to bear a proportion of the amount paid as war bonus to those of their staff who come within the scope of the Conciliation Scheme. Other reports mention that the new arrangement relieves the Government of 25 per cent. of the amount of the War bonus, and operates from January 1st, 1915, while the bonus to other railway employés and subsequent increases in the bonus generally are borne wholly by the Government as a working expense.

The form of the Accounts and Statistical Returns now presented is the same as that for the year ended December 31st, 1914, with the exception that Statistical Return No. 12 (Engine Mileage) has, with the approval of the Board of Trade, been omitted. In reference to the Taff Vale Railway, their report states that the receipts in respect of the railway and dock working, including the estimated amount receivable under the arrangement with His Majesty's Government for the year ended December 31st, 1915, amounted to £1,116,371 ; the working expenses amounted to £686,662, leaving a net balance of £429,709. Adding miscellaneous receipts, £8,012, and the balance brought forward from last year amounting to £14,021, the total amounts to £451,742. Deducting interest on debenture stock and other fixed charges and the dividends on preference stock, £250,046, there remains a balance of £201,696 available for dividend on ordinary stock. The interim dividend at the rate of 3½ per cent. per annum on the ordinary stock for the half-year ended June 30th, 1915, absorbed £90,869, leaving a balance of £110,827, which will admit of the payment of a dividend at the rate of 3½ per cent. per annum for the half-year ended December 31st, 1915, making 3½ per cent. for the year, carrying forward a balance of £19,958. A considerable portion of the Company's staff have responded to the call to the Colours, upwards of 800 having joined either the army or the navy, and, in addition, about 1,500 have attested

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under Lord Derby's Scheme. Suitable provision has been made for the wives, families and other dependents of the men during their absence.

Peculiar Features of Traffic Working under War Conditions.

SEVERAL references have been made to special features of train working, often of a "cosmopolitan" character, and Mr. J. Macartney Robbins sends an interesting series of notes concerning items observed by him during recent journeys over the West London Extension Railway, and at Willesden Junction. He tabulates them as follows :—

Willesden Junction (Low Level).

(1) No. 1193, *Richard Arkwright*, 4–4–0, on naval ambulance train.
(2) South Eastern and Chatham Railway No. 377, 0–6–0, on goods train.
(3) South Eastern and Chatham Railway No. 736, 4–4–0, on troop train.
(4) London, Brighton and South Coast Railway No. 77 departing on to down fast line with London, Brighton and South Coast Railway stock, troop train. This was previously piloted to Willesden by a 0–6–0 London and North Western engine, presumably from Addison Road.

Willesden High Level.

(1) Midland Railway (L.T.S. section) 4–4–2T locomotives on specials containing Belgians from Tilbury Docks to West Brompton for the Earl's Court Camp.
(2) London and South Western Railway No. 627, 0–4–2, on goods train.
(3) Great Northern Railway, 0–6–0 superheater, on troop train proceeding on to the Willesden-Gunnersbury line.
(3) Great Eastern Railway 0–6–0's, small class, on various goods trains.
(4) London and South Western Railway 4–4–0 mixed traffics, small class.

At Wormwood Scrubbs.

(1) South Eastern and Chatham Railway 4–4–0 and Hull and Barnsley Railway 0–6–0 on goods train proceeding to Great Western Railway line.
(2) South Eastern and Chatham Railway 4–4–0, rebuilt "Stirling," and 4–4–0 "Wainwright" on goods *ex*-Great Western line.

Addison Road.

(1) Midland Railway (L.T.S. section) 0–6–2 and 4–4–2 tanks.
(2) Great Western Railway "Flower" on troop train.
(3) Various South Eastern and Chatham Railway 4–4–0 "Wainwrights" of all classes.

For the last fifteen months there have been specials for the Belgian war refugees. These refugees were often sent round to West Brompton from Tilbury by special trains. The locomotives and coaches were Midland Railway (L.T.S. section) and worked throughout.

Special Traffic Working on the Midland Great Western Railway of Ireland.

A DUBLIN reader has directed attention to special traffic working arrangements adopted on certain days previous to Christmas Day in reference to the 5 p.m. down express from Broadstone station; and Mr. M. F. Keogh, General Manager, Midland Great Western Railway, has supplied the following particulars thereof :—Owing to the exceptional pressure experienced in previous years, it had not been found possible to secure the punctual working of the train in question, and delays of upwards of an hour in arrival at Sligo, Galway, and stations on the Mayo line had not been unknown. To meet this difficulty, the following arrangements were tried experimentally. The train was advertised to run from Broadstone in two portions, the first for Galway and the Mayo lines leaving at 5 p.m., and the second portion for the Sligo line, including Cavan, at 5.15 p.m. The second train was again divided at Mullingar, the first portion running express to Carrick-on-Shannon, and thence making the usual booked stops to Sligo, and the second portion performing the ordinary pick-up work on the Sligo branch. The service worked exceedingly well, passengers on the main line and Mayo branches reaching their destinations at the ordinary booked time, whilst Sligo was reached, notwithstanding the later departure from Dublin, rather before the ordinary booked time.

Notes on the Old Bodmin and Wadebridge Railway.

REFERENCES to this historical line published in recent issues has elicited some remarks from one of our long-standing readers and occasional contributors, the Rev. J. B. Baron Collins, of Wadebridge. Speaking of the carriage now exhibited at Waterloo station, he says :—

"This carriage was coloured white outside for the upper part and ultramarine blue for the lower part. There was a shorter two-compartment coach, and three- and two-compartment open carriages, with three vans having windows and doors in the ends, the vans being coloured a dull crimson red, one of them being a little lower than the others. There is a view showing all sorts of the rolling stock at the old Bodmin Wharf in Vol. VII. of the RAILWAY MAGAZINE. One van is now off its wheels at Helland Bridge siding as a store. At one time, in the 'seventies, a connecting line between Victoria, now Roche station, and Ruthern Bridge and across to Nanstallon, was contemplated, and an extension from Wenford Bridge to Camelford and on to Delabole, to reach the large slate quarries. A line from Wenford Bridge to the De Lank granite quarries, with a rope gradient, was made many years ago, and now the Wenford branch is much used by the Stannon Moor China Clay Co., who float the clay to three long 'dries' just below Wenford Bridge.

"The Looe line, before being taken over by the Great Western Railway, always had green

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engines, but at first and at the last, brown carriages, though for a time, when first linked up with Liskeard in 1901, had red Swiss-like carriages. The East Cornwall Railway had blue engines (three) and old London and South Western Railway carriages, coloured dark green, both being picked out with red lines. The old Cornwall Minerals Railway had brown carriages, and black engines named *Lord Robartes*, *Treffry*, *Fowey* and *Newquay*."

Mr. Collins writes further as follows :—

"There were two black engines for many years, *Bodmin* for goods, and *Scott*, which had a weather board. The *Scott* had a band halfway down the chimney. This engine was called after the then General Manager of the London and South Western Railway. Before the days of this old railway, a barge canal from Guineaport, close to Wadebridge, and above it on the river, was projected to Dunmere Bridge, one mile from Bodmin, with a branch from Cotton Wood to Ruthern Bridge. An Act was passed in 1796. It was to be called the Polbrock Canal, from a cluster of cottages between Wadebridge and Grogley. Live stock and certain goods, such as coal, timber, corn, were to be carried at 3d. per ton per mile ; other goods at 2d. per ton per mile, but certain goods would be charged 6d. per ton per mile. The powers obtained by the Act were never used. There was also at one time a proposal for a barge canal from Padstow to Par, and a few traces of this are to be seen where the high road from Bodmin to Truro passes over the eastern part of Tregoss Moor, at a considerable height above sea level, and near the fourth milestone from Bodmin."

An Armoured Train on the Uganda Railway.

On the outbreak of war, reports the Hon. B. Eastwood, General Manager, Uganda Railway, the staff responded with the greatest alacrity. Drivers uncomplainingly worked long hours, and all concerned worked with a will and energy that deserves and calls for credit to them. The demands made on the workshops were also very severe. The first work of any magnitude was the turning out of the armoured train. This necessitated a heavily armoured engine and tender, with two of the largest open bogie trucks armoured for a height of 6 ft., with loopholes for rifle fire and gun platforms for machine guns, while to prevent splinters a wooden casing was added on the outsides and the interstices filled with sand. Electric head-lamps supplied with current from a dynamo and accumulators, were provided at either end, and a search lamp was fitted in the centre of one of the trucks. This train was turned out complete in ten working days, and provided an effective patrol against German parties attempting to break the line.

Old guns were also brought in for repairs and rendered serviceable, and Maxims repaired and renewed in almost every portion save the barrels. One of the most difficult requests with which the staff had to deal was the complete manufacture of a goniometric sight for artillery purposes, and for which the most meagre information was available, so that the best way to construct it had to be ascertained by experiment. 3, 6 and 12-pounders were required and made, and it was necessary to design and construct mountings for two 4 in. guns, one of which was subsequently placed on the s.s. *Winifred*, and has done good service on the Lake. Shields for the mountain batteries were made, and these proved most useful and efficient, while numerous other jobs have been successfully tackled by the Nairobi and Kilindini workshop staffs.

A complete list is given, as follows :—

1. Armoured train.
2. Casting and manufacture of shot and shell, fitted with copper gas rings, for 40-pounder Armstrong guns.
3. Manufacture of 175 stretchers. These were constructed from country wood, and it is fortunate that investigations had been previously made into the respective values of the local timbers, so that an article not less suitable than those made of standard ash could be supplied.
4. Three pairs of heavy artillery wheels.
5. Making and fitting shields for Hotchkiss's guns.
6. Making and fitting shoulder plates for Maxim guns, together with the manufacture of various parts for these guns.
7. Shields for Maxim guns.
8. A dial sight director and stand with shield.
9. A hospital train. This meant the gutting of one bogie and three third-class carriages, and adapting them throughout for hospital train work.
10. Gun and side shields for the mountain guns.
11. Two pedestals for 4 in. guns. This was a heavy item, and required accurate fitting to admit of the guns being easily traversed, while the pedestals, which should be of cast steel, were built up out of wrought steel and braced to stand the strain put on them.
12. Several carriages and tripods with telescopic legs have been made for Maxim guns. In some cases it was required to make every item of the carriage ; for others certain parts only, but in all cases the work has been satisfactory and the tripods made have fulfilled all needs.
13. Several sets of side plates, firing pins and levers for Maxim guns have been made, and have proved satisfactory, although, in the absence of information, they had to surmise the quality of the steel to be used and also the method of tempering, etc.
14. For the mountain guns extension pillars were required to admit of the sights being raised over the gun shield, and in this instance the most delicate fitting was needed to avoid errors.
15. Donkey and mule pack saddles were made in considerable numbers, and, in addition, there have been almost innumerable requisitions made, ranging from shoulder badges for the volunteer regiments to items of a much more important nature.

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16. Urgent requisitions for gun metal and other castings were made by the naval authorities, some of which were supplied in the rough, while in other cases finished work was called for.

With reference to these items done for the military authorities, it is pointed out that there was but a scanty stock of materials from which to choose for dealing with any of this work in a straightforward manner, and that much of the work to be done required a specially-trained staff with special tools to execute it expeditiously, and neither of these items were available.

The last of the Great Western "Singles."

Referring to Mr. Little's remarks, recently published, Mr. J. A. Clark writes: "For many years these engines were general favourites on the line between Wolverhampton and Paddington, and it is not without regret that one has viewed their gradual withdrawal. Of course, they are unequal to the ever-increasing demand upon the services of a modern locomotive; even in the days of their prime I have known Honeybourne bank (on the up journey) prove a severe tax on their capabilities. But when one sees *Royal Sovereign* invidiously piloting a grimy 'goods,' one cannot but sigh 'Ichabod'! As regards the daily routine of No. 3020, I myself have frequently travelled from Birmingham to Stourbridge Junction behind a 'Single,' notably on the 1.3 *ex*-Snow Hill—a train on which *John G. Griffiths* was almost regularly employed then. But I cannot recall a single instance of any of these engines undertaking the return journey by the same route. It would be interesting to know how they fared, with the occasional heavy trains, on the severe ascent through Old Hill, including a two-mile stretch at 1 in 50."

Locomotive and Train Working in the latter part of the 19th Century.

Mr. Ahrons' articles continue to attract a considerable volume of correspondence, and part of a letter from a Scottish reader may be quoted: "Referring to Mr. E. L. Ahrons' interesting notes on Great Western locomotives, I may say I remember the *Pluto* in either '67 or '68. She then had the sand-box on the tank. She had also another peculiarity: the bogie pin was fixed to the boiler barrel. Neither the 4-4-0 nor the 0-6-0 saddle tanks had any cabs, and, I fancy, no pressure gauges. I also remember a four-wheeled vertical boiler locomotive working on the Falmouth Harbour lines. It was made by Sara & Co., as also several combined hoisting engines and boilers working there. At that time the turntable at Penzance would not admit narrow gauge tender locomotives, which had to be separated and each part turned by itself. There was a very steep incline down to some works at Hayle which was worked by tank locomotives. It must have been worse than 1 in 20. Possibly Mr. Ahrons might give the history of the *Rocket* that worked the Cheltenham-Gloucester branch. This engine had a haystack firebox."

In reference to this Mr. Ahrons remarks:—"Nearly all the early South Devon tank engines had the sand-boxes on the top of the saddle tanks, but were subsequently modified and the sand-boxes placed on the platforms in the usual manner. It is probable that the small shunting engine with vertical boiler by Sara & Co., 1868, mentioned by your correspondent, was Great Western Railway 2180 at a later date. The engine had vertical cylinders. I regret that I do not seem to have any details of the old Gloucester and Cheltenham engine mentioned."

Broad Gauge Single-wheelers at Newton Abbot.

In a paragraph last month under this title part of a letter by Mr. W. H. Robson, of Cardiff, was published, with some comments by Mr. Ahrons thereon. Mr. Ahrons now writes as follows:—

"I have just received a letter from a correspondent in Bath, which confirms Mr. Robson's statement (pages 145–146) that No. 2001 and not No. 2004 was the broad gauge engine in the Long Ashton accident of 1876. My correspondent writes with the Board of Trade report before him, and therefore must be correct. I must, therefore, withdraw my statement on page 146, which was written with one of the old railway journals of many years ago before me, which confirmed the number 2004. I was certainly under the impression that 2004 was the engine, but it appears that this engine ran off the road with the down 'Dutchman' at Hele some two or three months earlier than the Long Ashton disaster, and the two accidents may have been confused. I find that during the last two years of the broad gauge, the 8 ft. singles *Iron Duke* and *Warlock* were stationed at Newton Abbot. After the 'Cornishman' expresses were put on, there were necessarily some changes in the locomotive working."

Great Western Railway "Recollections."

As was to be expected, Mr. W. H. Robson, of Cardiff, also has something further to say on the subject, and a portion of his remarks may be quoted. Mr. Robson claims that all his statements are correct, and as will be seen, Mr. Ahrons agrees in reference to one point at least on the ground of further information which has come to hand. However, Mr. Robson may be allowed to speak for himself. He writes: "As regards the number of the engine that jumped off the road at Long Ashton in 1876, it was No. 2001, and I got this information confirmed by the workmen who took part in removing the engine and clearing the road after the accident. Some few years ago it was officially stated in the *Great Western Railway Magazine* that the number of the engine was No. 2004. I wrote to the editor and informed him that I thought this was a mistake and that the number of the engine was 2001. He replied and informed me that he had made

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inquiries and found that my statement was correct. It will also interest you to know that I have a photograph of No. 2004, taken when she was a tank engine, and the engineman shown in the photograph is John Millman, and not William Dunscombe, who was killed in the accident. It is very improbable that engineman Millman would have had the photograph of another man's engine taken, more especially within a day or so of the engine coming down from Swindon. I think the foregoing clearly proves that No. 2004 was not the engine in the accident."

"As regards the single-wheelers stationed at Newton Abbot from 1887 to 1892, this statement of mine is also correct. When the 'Jubilee' was put on in 1887 two or three of the B. and E. broad-gauge 7 ft. 6 in. single-wheelers were sent to Newton Abbot, and stationed there. They were driven by J. Phillips and George Harris. They used to bring up the 1.5 p.m. into Bristol (the 1.15 from Bristol to Paddington), and the up 'Jubilee' due at Bristol about 3.35 p.m. They returned to Newton Abbot with the down 'Zulu' (5.41 p.m. from Bristol), and the 8.15 p.m. from Bristol (5 p.m. from Paddington). I remember some time afterwards seeing engineman Phillips on the *Warlock*. This engineman, for many years previous to the above-mentioned period, used to bring up the 1.5 p.m. into Bristol from Newton Abbot, and return with the 8.15 p.m. down express. He then drove one of the 'Avonside' class. I remember him having the *Wood* and the *Sharp*.

Speed down Wellington Bank.

"In reference to my statements regarding the speed of the B. G. single-wheelers down Wellington Bank," continues Mr. Robson, "and the running of which is questioned, I may state that during my trip down the bank the engine was not pushed for all she was worth; the reversing lever was in the sixth notch and the regulator well open. It would have been an easy matter to have run the engine with the reversing lever in the fourth notch. I feel quite sure in my own mind that Mr. Ahrons would not get more than the 'usual' down Wellington Bank, as enginemen were always very cautious when anybody from Swindon was about, and in those days running at high speeds was looked upon by the officials as an offence. My father was reprimanded in 1890, on Bristol station, by a Great Western Railway official, who had travelled in the train behind him, with the up 'Cornishman.' The gentleman was quite unnerved and excited. In reply he was referred to the platform clock, which indicated that the train was only in to 'time.' The limit of the speeds of the B. G. single-wheelers was regulated by the nerve of the engineman and their fear of throwing their rods. My father threw the connecting rod of the B. G. single-wheeler *Tornado* coming down Bourton Bank in 1890, and to his immortal credit he was only half an hour late arriving at Bristol, having disconnected the broken and strained parts of the connecting rod, also centred the slide valve and uncoupled it in twenty minutes. This was done on the 'level,' and in the 'dark,' shortly after midnight. The train was moving towards Bristol in less than 25 minutes, but had to be stopped again to wait for the assistant guard, who had gone back to the signal-box to inform the signalman, the head guard having forgotten him when he gave my father the 'Right away.' This meant another 5 minutes on to the detention."

Some further "Recollections."

Mr. Robson also mentions that his father had as his fireman, at one period, Mr. J. G. Robinson, now Chief Mechanical Engineer, Great Central Railway, the engine being a narrow-gauge 7 ft. single-wheeler, No. 159, then newly out. He also writes:—"I am afraid Mr. Ahrons has inadvertently given your readers, in the one or two cases he has mentioned, a rather poor impression of the class of man on the footplate 30 or 40 years ago. He is quite right about 'Jones' of Swindon, who was, I am afraid, a rather peculiar man. I do not recognise the 'Welsh Druid' he mentions. I may say I have always, from a child, taken a keen interest in the G. W. and B. and E. engines, and distinctly remember the B. and E. 9 ft. tank engines, also the Bourton accident, though only six years old at the time. I remember my father having 2005, the one that came down from Swindon with 2001, and I can see the engine now in Portishead station, as in the summer of 1876, when she, together with a 2-4-0 saddle-tank, which was painted black (the B. and E. colour), took the train carrying the scholars of the Sunday School I used to attend on their annual treat from Bristol. I distinctly remember 2005 being painted a nice green colour, having just come down from Swindon, my father standing alongside her on the platform."

The Institution of Locomotive Engineers.

THE first annual meeting of the Institution of Locomotive Engineers since incorporated, was held at Caxton Hall, Westminster, on Saturday, January 29th, at 3 p.m. During the formal portion of the meeting the chair was occupied by Mr. A. J. Hill, Chief Mechanical Engineer, Great Eastern Railway, the retiring President. Announcement was made of the results of election of officers for 1916, and the secretary and treasurer, Mr. G. F. Burtt, then read the report and presented the balance sheet, the former indicating that while in some respects the past year had been a favourable one, in others there had been many difficulties owing to present conditions. Mention was made of the fact that two members had lost their lives, one from the Great Eastern Railway with the forces in France, the other assumed to have gone down with the *Persia*, torpedoed in the Mediterranean.

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Mr. Hill then presented the awards of premiums for the best papers read during 1915, the first going to Mr. W. A. Lelean, for his paper on "The Inspection of Locomotives," and the second to Mr. T. C. Thomsen, for a paper on "Lubrication." It was stated that Mr. A. R. Bennett, Vice-President, had repeated his annual generous contribution towards these premiums, while Mr. A. J. Hill's generosity had to be acknowledged; and the Chairman then stated that Mr. R. E. L. Maunsell, Chief Mechanical Engineer, South Eastern and Chatham Railway, had offered a further premium for a paper read during 1916 by a graduate of the Institution. Consequently for 1916 three premiums are available: from Mr. A. R. Bennett for Members' papers; from Mr. C. A. Suffield for Associate Members; and from Mr. Maunsell for graduates.

The chairman then referred to the decease of Mr. J. H. Adams, locomotive superintendent, North Staffordshire Railway, and the first President of the Institution. Following a few well-chosen remarks, Mr. Hill, on behalf of members of the Institution, presented a gold watch to Mr. C. A. Suffield, who for five years has served as Chairman of the Institution (a position abolished in the new organisation), and in recognition of the valuable services he has rendered. This concluded the formal proceedings, and Mr. Hill then introduced the new President, Mr. R. E. L. Maunsell.

Mr. Maunsell, on taking the chair, thanked Mr. Hill for his kind remarks, and in a few opening comments spoke of the pleasure it gave him to meet the members in this way, though his duties in national service prevented him doing what he would have liked to do in the way of a Presidential address. However, while not so detailed as it might otherwise have been, his address was listened to with great interest. Mr. Maunsell referred, first, to the work of the graduate section, emphasising the importance of studying those who will form the engineers of the next generation. He then passed to his more important subject, "Locomotive Design from the Point of View of the Running Shed Staff." This was listened to with great interest by a large gathering of members and others. As it was expected that Mr. Maunsell's address would not be a long one, arrangements had been made for two short addresses by Vice-Presidents. As it turned out, both the gentlemen concerned had selected retrospective subjects. Mr. A. R. Bennett referred to pioneer work for which the South Eastern Railway had been responsible, by Mr. Cudworth in reference to coal burning, Mr. R. C. Mansell for carriage wheels, Mr. Watson in connection with the telegraphic block system. He also mentioned the Bodmer and Crampton designs, and in signalling that the London, Chatham and Dover Railway had been mainly responsible for the development of the Sykes "lock and block" apparatus. Mr. J. H. Burnett, late locomotive superintendent, Metropolitan Railway, took as his subject early features of design as compared with methods in vogue now. He referred to work at Beyer, Peacock's in his early days, incidentally referring to an engine for Portugal built by them forty-eight years ago, and in service until just recently. In this case a query was raised only a few years ago as to proposed alterations whereby sharper curves could be traversed! Mr. Burnett referred to many features of practice, and exhibited a series of drawings showing complicated piston packing arrangements adopted in early days.

An Early Four-Cylinder Non-Compound Engine.

A Glasgow reader, Mr. Malcolm M. Niven, writes calling to mind that in 1895 or 1896 the Glasgow and South Western Railway built at Kilmarnock workshops what was then almost a unique engine. No. 11 was the earliest four-cylinder locomotive in the United Kingdom, and perhaps at that time the only one of its kind designed on the same lines. It had four high pressure cylinders and these were equal in area to two 20 in. cylinders. The valves were worked by four eccentrics and two sets of link motion. Dimensions were otherwise nearly the same as the No. 8 class, which came out earlier in the 'nineties. These were 4-4-0 express engines designed by Mr. James Manson. Nos. 8, 73 and 74 were the pioneers, all replacing Mr. Stirling's 2-4-0 engines. No. 11 was stationed at Carlisle, latterly it is believed, as a station pilot engine. Owing to a boiler being placed on it similar in capacity to the ordinary No. 8 class, the surface was not sufficient to maintain constant steam pressure, but a larger boiler was fitted in recent times. No. 11 is now rebuilt to the standard of the No. 26 class, which are the last engines Mr. Manson designed for passenger service.

Early Glasgow and South Western Railway Engines.

Mr. Niven further writes:—"Many of the familiar old numbers are either disappearing or becoming A's. All Mr. Stirling's 2-4-0's, which had perforated splashers, are with one or two exceptions scrapped. Mr. Smellie's 26's are also either A's or found only on branch routes. The latter engines were the Glasgow and Girvan engines, all stationed at Corkerhill depôt. I remember in 1898 there were Nos. 26, 27, 28, 29, 158, 186, 40, all Smellie 2-4-0 engines, famous in their day and generation. Latterly things have altered and modern engines have taken their place. Mr. Manson replaced them before he retired and during his régime he rebuilt the following Stirling bogie engines: Nos. 3, 4, 6, 10, 11, 15, 20, 36, 39, 44, 95, 96, 97, 98, 103, 104, 106, 107, 108, 110, 111, 112, 113, 114, 115. There may have been some others, but these were the old bogies built about the early 'seventies by Mr. James Stirling.

"The goods engines are similarly disappearing. Many of the 0-4-2 mixed traffic engines are now scrapped, or on the 'A' list, including Nos. 244A, 245A, built by Neilson in 1875.

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No. 256 class, built by Dübs in 1876, were all replaced by Manson bogies some time ago. No. 109 is a Smellie 4-4-0 stationed at Ardrossan, and No. 105 is a 0-6-0 shunting side-tank used at College and Eglinton Street goods yards."

The "Summit" of the Great Southern and Western Railway Main Line.

In a recent issue Mr. Allen referred to the Curragh as being the summit of the Great Southern and Western Railway from Kingsbridge to the south-west of Ireland. A reader at present in India contends that this statement is incorrect. He writes: "Surely your contributor, Mr. Allen, in his article in the December number of your magazine, is in error in stating that the Curragh is the summit of the Great Southern and Western's ascent from Kingsbridge. I have no gradient section of the line here, but one was published, I think, in the interview with Mr. Colhoun in your 4th volume, and my recollection both of it and my experience on the footplate is that Kildare is the summit. I should be very much obliged if you would clear up this point for me." The matter has accordingly been taken up with Mr. E. A. Neale, General Manager, as the gradient profile suggests that both statements are substantially accurate according to the point of view. Mr. Neale replies as follows: "The Curragh is the highest point on our main line between Kingsbridge and Mountrath, the height being about 475 ft. Between Mountrath and Ballybrophy there is, however, a higher point, approximately 550 ft., but the highest point of all on the line between Kingsbridge and Queenstown is between Mourne Abbey and Rathduff, approximately 575 ft."

We trust that this information will be of interest to our reader in Bengal, and at the same time thank him for his kind remarks in reference to the Railway Magazine, including congratulations upon the "excellent standard maintained during the past year," and expressing the opinion as a "reader from No. 1," that it has "never been better."

A Record Trip by "Napier" Car.

Messrs. D. Napier & Son, Ltd., send particulars of a record trip, hitherto deemed impossible, undertaken and accomplished by Mr. W. T. Forrest, of St. Magnus, Bowen Terrace, Brisbane. Mr. W. T. Forrest is the possessor of a fleet of extra strong Colonial "Napier" cars, and has recently arrived in this country in order to take up a commission in the Royal Field Artillery. It appears that 20 miles from Brisbane there is a long stretch of mountains known as the D'Aguilar Range, the highest peak of which is "Mount Glorious." The top of the mountain comprises about 20 acres of rich plateau land, but there is no road or even track to the summit, the slopes being thickly wooded and interspersed with "cut-outs," drifts and ravines. The height of Mount Glorious is 2,400 ft. from the base, and rises from a gradient of 1 in 9 to in some cases 1 in 3.

A DIFFICULT SITUATION.

It has hitherto been thought that the ascent of Mount Glorious by motor car was an impossibility, but this car, entirely under its own power and without any assistance, duly ascended and descended without mishap or faltering in the slightest degree. Mr.—now Lieut.—Forrest was accompanied by no fewer than 10 other passengers. The car was a 20 horse-power extra strong Colonial Napier.

Space will not allow the story of this notable trip being told in detail, but the photograph reproduced gives some idea of what it entailed in many places. This shows the car nearing the summit, at a most dangerous spot. The extreme gradient is apparent, also the rough nature of the track. It may further be mentioned that slightly to the rear of the car is a sheer drop of

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80 ft., so that if any mishap had occurred and the car started running backwards, the party would have been in considerable danger.

Our Empire Heritage.

At the offices of the Canadian Pacific Railway at Charing Cross is shown an attractive exhibit under this title. Extending the whole width of the window space is a huge picture map of the world, showing the British Empire, with a pictorial depiction of Empire facts and figures on one side and of inter-Empire trade on the other.

The picture map is headed by the words, "Do you realise the significance of the British Empire?" and on the lower border are the words, "What should they know of England who only England knows?" On each side a list of British possessions is given, and the route of the great Canadian Pacific Railway Imperial Highway between England and Asia *viâ* Canada, with its steamship connection to New Zealand and Australia, is marked.

The "Empire Facts and Figures" canvas illustrates in a realistic manner the resources of the British Empire. Khaki-clad soldiers show the relative armies of the United Kingdom, Canada, Australia, New Zealand, South Africa, India, and Crown Colonies and Protectorates now on active service. The estimated income of each component part of the Empire is also shown in like manner. The centre figures illustrate the comparative wheat productions of the Empire in 1901 and 1911, the large increase during the decade being due mainly to the extension of cultivation in Canada. Below is a pictorial representation of the live-stock of the British Empire, and the relative quantities owned by the various countries. Herds of cattle, flocks of sheep, and herds of swine are seen on the agricultural landscape.

The "Inter-Empire Trade" canvas illustrates in picture and figures what the Dominions supply to the United Kingdom. The produce of each Dominion and each dependency and crown colony is given in elaborate yet pleasing detail. Each principal product from each overseas possession is dealt with, the idea of the design being a series of trade "tentacles" centring on the United Kingdom.

The "Railway Magazine" and the War.

Many Railway Magazine readers have written expressing gratification at the high standard this publication has maintained in spite of the difficulties consequent upon the great war. Oversea subscribers in particular have been very lavish in their kind appreciation. There is one difficulty—the well-known paper trouble—which many readers may actively assist the publishers to overcome. Let us explain. The great bugbear of the magazine publishing trade is the return of unsold copies caused by readers not making their purchase at the same shop or bookstall each month. Let all Railway Magazine readers place a definite order with a bookstall manager, newsagent or bookseller to supply the magazine monthly until the order is countermanded and our paper trouble, in spite of the restrictions enforced by the Government, would be largely solved. Bookstall managers and newsagents would know exactly how many copies to order, and waste of paper would cease. All Railway Magazine readers must have learned from the daily and weekly newspapers how acute is the paper difficulty and how very real is the possibility of a paper famine in the near future. May we solicit their kind co-operation in this matter? If there is any obstacle in the way of placing an order with a newsagent or other trader, we will send the magazine post free to any address, three months for 2s., six months 3s. 9d., or one year 7s. 6d.

Although a paper famine may compel the proprietors of the Railway Magazine to reduce the number of pages, there is no intention of letting down the quality of the reading matter and illustrations. Very elaborate arrangements are in hand to ensure general attractiveness and value throughout the remainder of the war.

Just one suggestion to readers who are about to be called to the British Army under Lord Derby's scheme. When you have been placed in a regiment, either arrange with your friends or a bookseller to send you the magazine regularly, or forward us your name, number, rank, etc., with a subscription, and the magazine shall be mailed monthly no matter in what expeditionary force you may be engaged. Many readers who joined the Army in the early days of the war have much regretted the neglect of this elementary precaution. See that you do all that is necessary to ensure the continual receipt of your favourite magazine.

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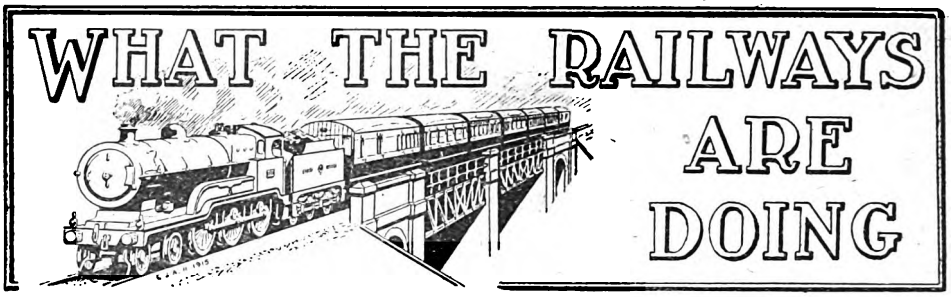

THE first of a series of efficiency meetings, which are being arranged for officials of the operating department by Mr. H. E. Blain, the operating manager of the Underground Railways and London General Omnibus Group, was held at Electric Railway House, Westminster Broadway, when a paper on "Mess Rooms and their Organisation" was read by Mr. S. G. Rodway, mess room superintendent of the London General Omnibus Co., Ltd. The chair was occupied by Mr. Blain, amongst others present being: Sir Albert H. Stanley, Managing Director; Mr. James Devonshire, Managing Director of the London and Suburban Traction Co., Ltd.; Mr. Z. E. Knapp, railway manager for maintenance and construction; Mr. W. F. Rainforth, assistant chief engineer, London General Omnibus Company; Mr. J. P. Thomas, general superintendent, London General Omnibus Company; Mr. H. Lansdown, assistant general superintendent, London General Omnibus Company; Capt. A. Rozier, A.S.C., superintendent of training and employment, London General Omnibus Company; Mr. W. E. Blake, railway superintendent of the line; Mr. S. J. Webb, railway passenger agent; and about thirty other officials.

The Chairman said that the series was being arranged for the purpose of enabling both the outside and inside officials to discuss, from an efficiency standpoint, the methods adopted in the operation of the railways and 'buses, with a view to improve them still further, and the frankest expression of opinion was invited.

* * *

MR. RODWAY'S paper detailed the mess room organisation of the London General Omnibus Co., Ltd. In all the later-built garages, it was now the policy to erect large and comfortable rooms available as mess rooms and institutes, where the catering was provided at the lowest possible price, and facilities for billiards, etc., were afforded. The first was opened at Hendon Garage in May, 1913, since which date sixteen others had been opened, these being at Cricklewood, Willesden, Seven Kings, Streatham, Merton, Milman's Street, Hammersmith, Turnham Green, Chelverton Road, Golder's Green, Forest Gate, Holloway, Hounslow, Plumstead and Catford, catering facilities being also furnished at Victoria station. The gross number of purchases made at these mess rooms per annum was now about two millions, the average amount of each transaction being 2.44d. The food, etc., was sold at a cost which covered the wages of the mess room working staff, but the account was not debited with any portion of the cost of construction, maintenance, or lighting of the institutes. The war having forced a higher state of efficiency, it had been found that by the careful selection and introduction of modern devices for saving labour and material, such as automatic potato peelers, patent boilers, floor scrubbers, etc., and by making all the pastry at home instead of purchasing from outside, it had not been necessary to raise the mess room tariff, except very slightly in connection with tea.

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THE passenger lifts at Wapping, East London Railway, were brought into public use on October 4th. The facilities, obviating the ascent or descent of 100 steps, is evidenced by the fact that during November, 1915, 87,800 passengers were booked to and from Wapping with East London local stations only, as compared with 61,005 in the same month 1914, when the existing electrical traction had been already eighteen months in force.

Owing to the war a general limitation has been placed upon the volume of goods, coal and live stock traffic passing over the East London Railway from and to the North and Midlands. This was rendered necessary in order to deal with a considerable increase of traffic between the Southern and the Eastern Counties, including heavy consignments in both directions on account of the Government, to which priority had to be given.

* * *

H.R.H. PRINCESS LOUISE (Duchess of Argyll) recently opened a Sailors' and Soldiers' Rest and Refreshment Hut at King's Cross. The site, which is outside the station, was given by the Great Northern Railway. The building is the gift of Mr. and Mrs. Alexander Joy, of Leeds, who also take part in the management with a staff of women volunteers. Among those present were Sir Francis Mowatt, G.C.B. (Director, Great Northern Railway), Mr. Dent, Mr. Brickwell, and Lord Haddo. Major-General Sir F. Lloyd (commanding the London District), who presided, referred with gratitude to the good work of the Y.M.C.A. both at home and abroad. The building was designed by Mr. S. P. Eales, and accommodation includes recreation room, bar, kitchen, and offices, baths, lavatories, kit store, drying-room, and cubicles to accommodate thirty-two men.

* * *

SINCE the beginning of the war there has existed necessity for a tea-room at Inverness

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railway station, at which soldiers and sailors journeying by train could obtain refreshments. The Highland Railway has therefore placed a waiting room at the disposal of the ladies and gentlemen who have taken the matter up, and has also generously undertaken to provide coal and gas free. The room was opened recently. It is available from 4.30 in the morning, in order to meet the arrival of the night train from Perth, until 11 at night.

* * *

COMMENCING February 1st, 1916, the strip and four-weekly season tickets were withdrawn from issue by the London Electric, Central London, and City and South London Railways. The reasons for this change are twofold. First, the shortage of staff due to the war has necessitated the reduction of ticket checking work to a minimum. Secondly, these forms of ticket have proved to be easily open to abuse. In place of these tickets a new monthly season ticket has been introduced, and for all important issues is sold direct at the booking offices without delay, just as an ordinary ticket. For check and record it will be necessary to ask passengers desiring such tickets, in the first instance, to fill up their names and addresses on a slip, but for all renewals of the first ticket it will be sufficient to hand in the expired ticket not later than the day after its expiry at the booking office of issue, in exchange for a new one.

* * *

THE quarterly season ticket rates by the Metropolitan, London Electric, District, and Central London Railways in the Central London area are on a low basis compared with the sum of the daily fares. For example, the rate from Hammersmith to Mansion House was 28s. 9d., and compared with an ordinary fare of 3d. The usual rate for a 3d. fare is 32s. 6d. Commencing February 1st, 1916, these low rates were increased to the more usual level of charge and some minor adjustments made. The increases are confined to the area between Hammersmith and Wood Lane on the west, and Aldgate and Aldgate East on the east, and cover stations on the Circle, and on the UndergrounD Railways within the Circle. They do not, therefore, affect the residential suburbs around London. In addition, the minimum price of a season ticket on the UndergrounD Railways has been reduced from 17s. to 15s. for a quarterly ticket in respect of a penny fare.

* * *

REFERRING to the new viaduct at Kilburn, forming the last section of the widening of the Metropolitan Railway between Finchley Road and Wembley Park, the Annual Report of the Directors points out that although considerable additional traffic has been attracted by the improvement in the train services which the new lines have enabled the Company to effect, under the terms of the arrangement with the Government no benefit at present accrues to the Company from the earnings of new lines and works brought into use since 1913, although they have to bear the interest on the capital raised for their construction. Representations have been made to the Government on this point, and it is confidently expected that the equity of claims for consideration in this respect will be recognised. Notwithstanding the dislocation of business occasioned by the war, the traffic carried on the Metropolitan Railway generally during last year was in excess of that carried in the year 1914, and also exceeded the traffic of 1913. On the Great Northern and City section the traffic has largely increased, in response, no doubt, to the improved train services introduced since that line was acquired. In view of national necessities, every possible economy has been exercised, but owing to the heavy traffic and to the large number of troops conveyed in addition to the ordinary traffic, it has not been possible to make any material reduction in the number of trains run. A contract was let in the early part of the year for the erection of the hotel at Baker Street. The work is being carried out at a much reduced speed owing to the necessity for limiting capital expenditure during the period of the war.

* * *

SINCE the commencement of the war, passengers for Russia have travelled from Newcastle-on-Tyne to Bergen in Norway, thence overland *viâ* Christiania, a new and attractive route to the East made possible by the opening, a few years since, of the railway from Bergen across the mountains to Christiania. A daily service from Newcastle has been maintained by the B. & N. Line Norwegian Royal Mail Steamers, and some 1,200 crossings of the North Sea, carrying tens of thousands of passengers, have been accomplished without a single mishap. The importance of this international highway to Scandinavia, Finland, Russia and the Far East being recognised, the B. & N. Line have had a new steamer, *Jupiter*, built, and her first voyage from Newcastle to Bergen was on Saturday, January 29th, and will also sail each Saturday. This vessel of 2,600 tons is 326 ft. in length, with a breadth of 41 ft., and will be the largest and fastest passenger steamer between Newcastle and Norway. Steaming 16 knots, she is expected to reduce the sea passage to Bergen to about 26 hours instead of 32 hours as formerly. The journey from London (King's Cross station) to Bergen will be accomplished in 32 hours, including a night in harbour in Bergen. There is accommodation for 90 first-class and 80 third-class passengers. Each cabin is provided with a telephone. Wireless telegraphy is, of course, installed, and all the latest improvements of shipbuilding science have been considered in the construction, a notable feature being a double bottom which runs the whole length of the vessel. Tickets and berths may be secured at the Norway Travel Bureau (Great Northern Railway), 179, Strand, London.

* * *

FOLLOWING the retirement of Captain Henry W. Hemmings, the Great Western Railway Company's Assistant Marine Superintendent at

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Weymouth, the following official staff changes have been made:—Capt. Eugene Robin, Dock Master at Plymouth, becomes Assistant to the Company's Marine Superintendent. He will, in that capacity, act for Capt. Humphreys, as occasion may require, in connection with the supervision of the Company's steam and other vessels, and marine matters at Weymouth and in the West of England generally, as well as continue to act in the capacity of Dock Master at Plymouth. Capt. Robin joined the Company's service in December, 1891, was appointed Pier Master at Plymouth Docks in July, 1894, and became Dock Master in December, 1904. Mr. Percy Boyle, Chief Clerk to Capt. Hemmings, has been appointed Traffic Agent at Weymouth Quay, where he will have charge of the loading and discharging of the boats in the Channel Islands service and the general arrangements in connection with the passenger and cargo business. Mr. Boyle entered the service of the Company in July, 1883, in the Marine Department at New Milford, and has been engaged at Weymouth since July, 1889.

* * *

Mr. Thomas Moffet, who has recently been appointed Assistant Estate and Land Agent to the London and North Western Railway, joined the Estate Department in 1876, when its headquarters were at Liverpool. He came to London in 1880 when the Estate Department and Land Agency were combined and centred at Euston. Until then the Land Agent had his headquarters at Rugby. Mr. Moffet has, therefore, been connected with the department for about 40 years, and he has for many years held a position as one of the chief assistants to Mr. Mackie, late Estate and Land Agent of the Company.

* * *

Sir William Forbes and Sir Francis Dent have been entertained by the members of the Railway Executive Committee to dinner at the Euston Hotel. Sir Herbert A. Walker presided, and among those present were: Mr. J. A. F. Aspinall (Lancashire and Yorkshire Railway), Mr. Guy Calthrop (London and North Western Railway), Mr. C. Dent (Great Northern Railway), Sir Sam Fay (Great Central Railway), Mr. D. Matheson (Caledonian Railway), Mr. Frank Potter (Great Western Railway), Mr. J. Tatlow (Midland Great Western of Ireland), Mr. H. W. Thornton (Great Eastern Railway), Sir Robert Turnbull (London and North Western Railway), Mr. A. Watson (Lancashire and Yorkshire Railway), Major G. S. Szlumper (Secretary to the Railway Executive Committee), and Mr. A. Sire (Northern of France Railway).

* * *

The London and South Western Railway have introduced "Pull and Push" trains in the following services: (a) Clapham Junction–Kensington–Richmond; (b) Windsor and Woking; (c) Gosport and Fareham. These trains consist of two-coach bogie-set trains, with a tank engine, and are so constructed that they may be either worked from the engine or the brake-compartment end, and the necessity of the engine to run round the train at the termini is thereby obviated. The trains provide accommodation for 18 firsts and 110 thirds, second-class having been eliminated.

* * *

The Great Western Railway Directors have recently authorised new works as follows:—Provision of additional siding accommodation at Dudley; alterations to enable the practice of tow roping to be abolished at Ascott-under-Wychwood and Llanfyrnach. A contract has been placed for the extension and other alterations to the goods office at Llanelly station.

* * *

Of the twenty 4–6–0 passenger engines ("Prince of Wales" class) now in course of delivery to the London and North Western Railway by the North British Loco. Co., Ltd., Glasgow, the first ten will be as follows:—Nos. 136 *Minerva*, 173 *Livingstone*, 257 *Plynlimmon*, 446 *Pegasus*, 1749 *Precedent*, 2063 *Hibernia*, 2175 *Loadstone*, 2203 *Falstaff*, 2300 *Hotspur*, and 2392 *Caliban*. In the meantime a series of engines of similar type is being turned out from the Crewe Works, the first five of which bear Nos. 606 *Castor*, 745 *Pluto*, 1352 *The Nile*, 1379 *Witch* and 1484 *Smeaton*. It will be noticed that the above names were all formerly borne by engines of the 6 ft. 6 in. and 6 ft. "Jumbo" classes. One of the most recent withdrawals from service is the 6 ft. 6 in. "Jumbo" No. 942 *Shah of Persia*. This engine was named in honour of the visit of the late Shah of Persia to the Crewe Works in 1873. Several more of the Webb four-cylinder compound passenger engines are being converted to two-cylinder simple with 18½ in. by 24 in. cylinders, including No. 1959 *Revenge*, which will shortly be running.

* * *

On the Great Eastern Railway new engine construction during 1915 was confined to four of the 4–6–0 express locomotives (Nos. 1535–8) and the 0–6–2 superheater tank engine No. 1001. But a large amount of attention was given to maintenance, and there were about 50 instances of rebuilding, whilst over 200 engines underwent heavy repairs. The new coaching stock turned out during the year included ten composite and a similar number of third class carriages, twenty-five brake thirds, two composite brakes (*i.e.*, composite carriages with brake compartments) and five brake vans—all four-wheeled bogie type—together with ten general vans and four specially constructed bogie ward cars for ambulance trains, in the provision and equipment of which the department was very busily engaged. The Temple Mills Wagon Shops turned out 130 covered goods, fifty cattle and fifty high side wagons.

* * *

Mr. Robert Pratt, foreman porter, West Side Suburban, Liverpool Street (Great Eastern Railway) has retired after 43 years' service.

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He has been at Liverpool Street since its opening for local traffic in February, 1874, and was the first foreman-porter at the terminus. Prior to this date he was at the old Bishopsgate passenger station. "During his forty-one years on the west side," says the *Great Eastern Railway Magazine*, "Mr. Pratt was a familiar figure to more than one generation of suburban passengers and was respected by both travellers and staff. A characteristic way of delivering his train-starting signal led him to earn the sobriquet of 'Coo-ee.'"

* * *

At the Railway Club meeting on Tuesday, Feb. 8th, Mr. G. W. J. Potter gave an interesting paper on "The Colour of Railway Signals," exhibiting a series of lenses and spectacles as used in British and American signal practice to illustrate his remarks. At the meeting on March 14th Mr. H. W. Bardsley will read a paper on "Bradshaw." Visitors tickets can be had on application to the Hon. Secretary, Mr. E. J. Miller, 92, Victoria Street, Westminster, S.W.

* * *

A room on No. 6 platform at New Street station, Birmingham, has been converted into a Refreshment Buffet, and during the night, between the hours of 8.0 p.m. and 6.0 a.m., tea coffee, and sandwiches are supplied to soldiers and sailors free of charge. It is supported entirely by voluntary contributions.

The number of North Eastern Railway men who have joined the Colours since the beginning of the War is 10,457, and of these 234 have lost their lives. The battalion raised from members of the staff (17th Northumberland Fusiliers (North Eastern Railway Pioneers) is now serving abroad, and, in accordance with a request from the War Office, a reserve battalion is being formed (32nd (Reserve) Northumberland Fusiliers). The directors report that the electrical equipment of the line between Shildon and Newport has been completed, while substantial progress has been made with the reconstruction of the north entrance at the Hartlepool Docks, and the work is nearing completion. It is proposed, in conjunction with the Lancashire and Yorkshire Railway, to apply to the Light Railway Commissioners for an Order to revive the powers granted by the Axholme Joint Railway (Hatfield Moor Extension Light Railway) Order, 1910, by virtue of which the two Companies were authorised to make a deviation of a short portion of the Hatfield Moor Extension Light Railway.

WOMEN BILLPOSTERS APPOINTED BY THE METROPOLITAN RAILWAY IN PLACE OF MEN WHO HAVE JOINED HIS MAJESTY'S FORCES.

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New works completed during last year by the Great Central Railway include a widening of the line at Godley, a new goods depôt at Blast Lane, Sheffield, and the reconstruction of Barnetby station. The new ventilating shaft in Woodhead Tunnel, together with the chamber connecting the shaft with the tunnel, has been completed, and has proved very beneficial. The Deviation Railway at Keadby and the new railway-and-

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highway bridge over the river Trent is approaching completion, and will shortly be brought into traffic. Widening of the line between Doncaster and Thorne is proceeding somewhat slowly on account of the scarcity of labour. Permanent way, except for a short length, has now been laid throughout, and the re-building of the stations at Barnby Dun and Stainforth is almost finished. A commencement has been made with the construction of sidings to connect the colliery now being sunk in the vicinity of Stainforth station. A contract has been entered into for the provision of a new coal hoist at the Grimsby Fish Dock, but the work is in abeyance owing to the War. Part of the additional hydraulic machinery authorised for improving the facilities of the Fish Dock has been erected and brought into use.

* * *

GOODS and mineral traffic conveyed over the Furness Railway during the year 1915 has been one of the largest on record. No effort, however, has been spared in order to work the traffic in a satisfactory manner, so far as the engine power and reduced staff, owing to a considerable number of the men having been allowed in the early part of the war to join the Colours, would permit. Four engines for renewals, the order for which was placed in March, 1915, have unfortunately not yet been delivered, but with the assistance of the Ministry of Munitions, the Directors state that they hope to receive these much-needed engines very shortly. Four new engines, also for renewals, were, however, delivered in March, 1915. Two more engines for renewals have been ordered in February, 1916. The reconstruction of the Leven Viaduct, which was commenced in the year 1913, was completed in 1915.

* * *

THE principal Scottish railway companies introduced further reductions in passenger train services on February 14th. Alterations on the Caledonian line affect nearly every section of the system, and involve extensive curtailment; for instance, on the Edinburgh and Glasgow and Glasgow and Edinburgh with Carlisle, main lines, some eighteen trains will be discontinued. On the North British system the principal ones are the 10.40 a.m. from Edinburgh to Aberdeen and the 3.30 p.m. Aberdeen to Edinburgh; but there are a number of alterations in other services.

* * *

IN view of the great success attending the high-level tea-room at Liverpool Street station, Great Eastern Railway, another room of the same size has been constructed. For the time being the new room is being utilised in place of the old one, pending re-arrangement of the latter; but in due course the two will be in simultaneous use. They are built out from the footbridge, opposite the ends of platforms Nos. 4 and 5.

* * *

THE Great Eastern Railway has built four ambulance trains—two in 1914, one being for England and one for the Continent; two in 1915, both for the Continent; and two are at present in course of construction—one for England and one for the Continent.

* * *

ARRANGEMENTS with the Belfast Corporation for the covered carriage way at the front of Belfast passenger station (Belfast and County Down Railway) having been definitely concluded, the work is now being proceeded with. The down platform at Holywood station is being raised and improved. Additional siding accommodation has been provided in the goods yard at Tullymurry to deal with the military traffic to and from Ballykinlar Camp. Two new tank locomotives of a powerful type have been ordered from Messrs. Beyer, Peacock & Co., of Manchester. A new "Foden" road motor and trailer have been purchased to replace the first road motor, which commenced working between Newcastle and Kilkeel twelve years ago. The Company's steamer, *Erin's Isle*, has been requisitioned by the Admiralty for Government purposes.

* * *

IT is officially notified that the Great Eastern, Great Central, and Great Northern Railway Companies have come to an agreement for pooling their goods wagons, with a view to promoting greater efficiency at the present time. The arrangement came into operation on January 1st last. This is a natural outcome of the working agreement between the three Companies, whose systems form a convenient unit distribution area.

* * *

A FREE canteen for soldiers and sailors travelling by train, conducted by a Joint Committee consisting of representatives of the Women's Legion and the ladies engaged in the clothing depôt for Belgians, was opened at Queen Street station, Glasgow, North British Railway, on February 7th, by the North British District Superintendent at Glasgow. Lady Inverclyde, on behalf of the promoters, thanked the Directors and Manager of the North British Railway Company for providing the accommodation for the canteen.

* * *

WE regret to announce the death of Mr. William Dawson, hon secretary of the Retired Railway Officers' Society.

* * *

LORD ALLERTON, Chairman of the Great Northern Railway, has been elected Master of the Shipwrights' Company. The new Wardens are Mr. T. L. Devitt, Sir Archibald Denny, Lord Inverclyde, and Mr. E. C. Kirkness.

* * *

NEW London and North Western 4-6-0 engines of the latest "patriotic" series, are stationed, we are informed, as follows: No. 88, *Czar of Russia*, at Camden; No. 2275, *Edith Cavell*, at Rugby; No. 160, *King of Serbia*, at Crewe; and No. 877, *President Poincaré*, at Camden.

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WE regret to announce the death of Mr. William McLaren, Chairman of Messrs. G. D. Peters & Co., Ltd., with whom he had been associated practically all his business life. He was well known throughout the railway world. Mr. McLaren was also Chairman of the Superheater Corporation, Ltd.

* * *

MR. CHARLES SHEATH, Secretary of the South Eastern and Chatham Railway Companies Managing Committee, has been elected Master of the Paviors' Company.

* * *

THE Board of Trade have recently confirmed the Milford and Saint Bride's Bay Light Railway Order, 1916, authorising the construction of Light Railways in the County of Pembroke from Milford Haven to Saint Bride's Bay.

* * *

THE Rt. Hon. Lord Joicey, Deputy Chairman. North Eastern Railway, has kindly accepted the Presidency of the Railway Benevolent Institution for the current year.

* * *

THE Rt. Hon. F. Huth Jackson, a Director of the Bank of England, has been elected a Director of the London and South Western Railway to fill the vacancy caused by the resignation of the Earl of Selborne.

* * *

AT a meeting held in the Irish Railway Clearing House, Sir William J. Goulding, Bart., D.L., was unanimously re-elected Chairman of the Clearing House Committee for the year 1916.

* * *

MR. A. T. COTTON, London and North Western and Lancashire and Yorkshire Railway Joint Agent at Belfast, has been appointed District Traffic Superintendent, London and North Western Railway, at Abergavenny.

The death of Sir Charles Rivers Wilson, for some years President of the Grand Trunk Railway of Canada was recently announced. He was born in 1831, the son of Mr. Melvil Wilson, and grandson, through his mother, of Sir Benjamin Stephenson. Educated at Eton and Balliol, he entered as a clerk in 1856 the Treasury. After eighteen years' experience in this department, Sir Charles was appointed Comptroller-General of the National Debt Office, a position he held until 1894, and for a time acted as Finance Minister in Egypt. While occupying that position he was designated one of the British Government administrators of the Suez Canal Company, in which shortly after he became Vice-President. In 1895 he resigned his office in Egypt in order to become President of the Grand Trunk Railway of Canada, and during his tenure of office the most important of his undertakings was the scheme of new constructions, of which the chief was the Grand Trunk Pacific Railway, destined to open yet new chapters of development of Canada's resources. On this new Transcontinental line in the past eleven years over 3,000 miles of railroad have been constructed west of Winnipeg.

* * *

A SYSTEM for the recognition of long and faithful service has recently been inaugurated on the Canadian Pacific Railway. This is the issue of service bars to passenger train conductors, sleeping car conductors, passenger trainmen, and sleeping car porters, to be worn on the left sleeves of their uniforms as follows :

Passenger Train Conductors.—One bar (gold braid) for 15 years in the company's service, and an additional bar for each complete additional five years' service.

Sleeping Car Conductors.—One bar (gold braid) for 10 years in the company's service and an additional bar for each complete additional five years' service.

Passenger Trainmen and Sleeping Car Porters.—One bar (silver braid) for 10 years' service and an additional bar for each complete additional five years' service.

* * *

THE Swiss Federal Government has, it is stated, definitely decided to electrify the whole of the Swiss railways. The first line to be electrified will be the Erstfeld-Bellinzona section of the St. Gothard line. The cost of electrifying the Federal railways is estimated to be £20,000,000, which will be raised by successive issues of five per cent. federal bonds.

* * *

THE Victorian Railways Commissioners have made the following appointments in connection with the installation of automatic signalling on the suburban railways now in course of electrification : Mr. G. H. Wion, Pennsylvania Railroad, Assistant Signal Engineer for five years from July, 1914 ; Mr. C. W. Prescott, London Underground Railways, transferred to the service of the Commissioners for three years from February, 1915 ; Mr. T. Kittredge, from the United States, track circuit designer draughtsman, for three years ; Mr. W. J. Huggins, assistant inspector of signals and telegraphs, Metropolitan Railway, signal foreman and instructor of fitters, for five years from December, 1914. Mr. J. Rist, Central London Railway, has been engaged for training motormen, guards, and other employés.

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IT is understood that the Canadian Car and Foundry Co., Ltd., of Montreal, has just concluded a contract with the Paris and Orléans Railway for two thousand Gondola cars through their representative in Paris, Mr. William Garthwaite, who was formerly connected with the Brazilian group of railways under the Farquhar management.

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Railway Literature.

The Railway Year Book for 1916.

For the nineteenth consecutive year this indispensable railway reference work will be published on March 25th. Never during the long period since its first publication has this "Whitaker of the Railway World" been of more real utility than at the present time. Within its bright red covers is information unobtainable elsewhere save at the expenditure of a vast amount of time and trouble. A knowledge of the contents of this valuable annual is a railway education in itself, and no one—be he a practical railwayman or a student of railway affairs—can truthfully claim to have a proper grasp of the ramifications of the railways of the British Isles until he has thoroughly studied the Railway Year Book.

Exhaustive revision was the keynote of the 1915 edition, but many further improvements will mark the issue for 1916, in which all the much-valued standard features will be retained. The alterations in the directory portion of the book are extensive and important. Historical sketches have been brought down to date and fresh facts inserted. The unique "Railway Officers Who's Who" has been entirely re-cast and set in a new and attractive type.

In spite of the great increase in the cost of production by reason of the War, the price will be 2s. 6d. net, as in previous years. Postage in the British Isles is 5d. per copy; abroad, 8d.

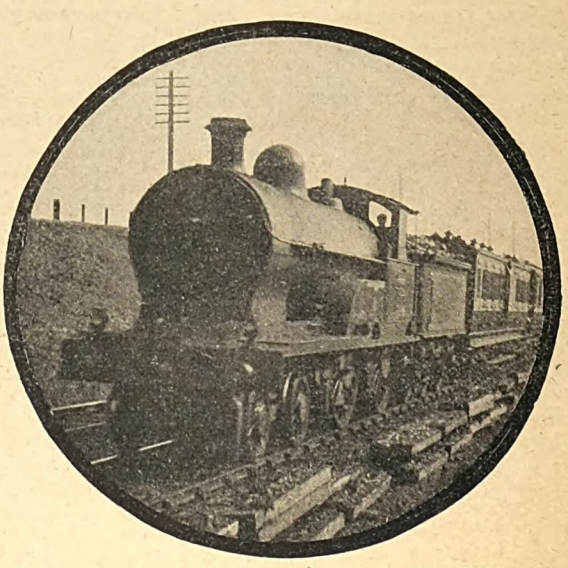
British readers should place their orders with their booksellers at once, and oversea subscribers are advised to send their instructions and remittances by the next mail.

* * *

The Locomotive Engineer's Pocket Book and Diary, 1916. [The Locomotive Publishing Co., Ltd. Price 2s. 6d. net.] This useful pocket book is again issued in its usual convenient and attractive form. Characteristic features are retained, a wealth of useful information being included within its pages, in addition to the portion provided for use as a diary.

* * *

The Practical Engineer Pocket Book and Diary, 1916 (Mechanical) and The Practical Engineer Electrical Pocket Book and Diary, 1916. Once again the Technical Publishing Co., Ltd., of 1, Gough Square, Fleet Street, London, E.C., send copies of their new pocket books and diaries for 1916. Brought up to date, these annuals provide for a wide field of usefulness. Prices of both are: Peltine binding, 1s. 10d., post free; cloth binding, 1s. 4d., post free. Abroad the corresponding post free prices are respectively 2s. and 1s. 6d.



Photo] [*W. H. C. Kelland.*

LONDON AND NORTH WESTERN RAILWAY.

Express train near Lancaster.
4–4–0 engine No. 1733, *Grouse.*

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THE RAILWAY MAGAZINE.

Contents for April, 1916.

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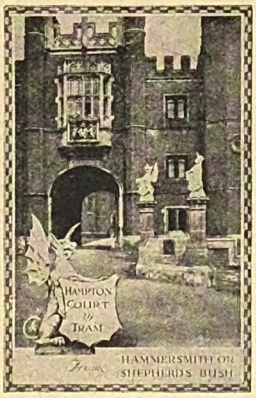
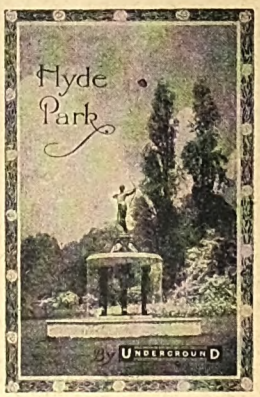


A further series of little booklets on London is now in course of preparation. Several have already been published and others will be issued shortly.

UNDERGROUND



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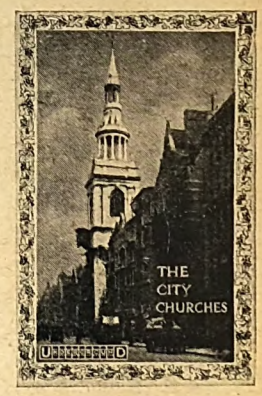
Copies of the three booklets illustrated in this advertisement may be obtained on application to the Advertising Manager.



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LONDON AND NORTH WESTERN RAILWAY.

Glasgow–London Restaurant Car Express leaving Carlisle.

4–6–0 four-cylinder locomotive "Lord Rathmore."

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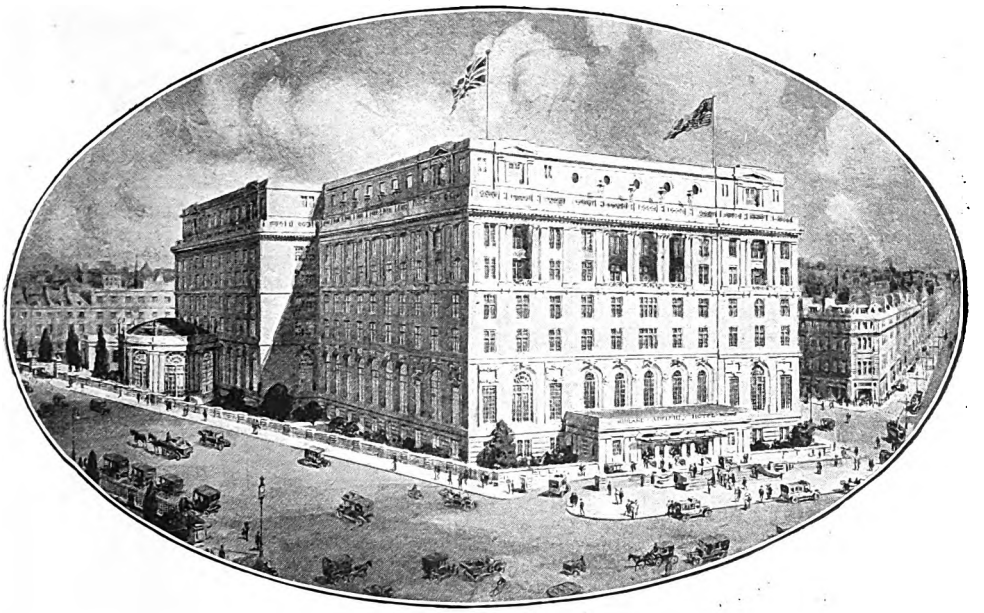

MIDLAND ADELPHI HOTEL, LIVERPOOL.

The Hotels, Refreshment Room and Restaurant Car Department of a Great Railway.

By J. F. GAIRNS.

Be it known also

by all modern visitors to our Township —whether from Overseas or elsewhere that We, the Midland Railway Company —have erected a most sumptuous Residence in the said Township, where you may have all the liberties and luxuries of Hotel and Social life of the highest order: and

We invite you

therefore that securely and in our peace you come there to inhabit this our new house, and receive of luxury and comfort unparalleled in the history of this or any other Township.

THUS runs an invitation given—by way of introduction—as an addendum to a reproduction of the Charter granted in 1207 by King John to the city of Liverpool, and still preserved in the Municipal Buildings, Dale Street—in a handsome brochure published in 1914 by the Midland Railway in celebration of the completion of the remodelling and extension of the now famous Midland Adelphi Hotel, Liverpool. It is claimed that this is admittedly "the world's latest and greatest hotel"; and while neither supporting nor contradicting such claim, it is beyond question that in respect of its hotels the Midland Railway Company has attained such a standard of excellence, and its reputation in regard to all of its activities in catering for the physical needs of its patrons is certainly of such an high order that no apology need be made for selecting the catering system of the Midland Company for consideration. This course is further supported by the fact that in several respects the organisation of this department is peculiar to the Midland Railway, and includes features of particular interest.

It used to be said that the sole business of a railway company is to sell transportation,

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from 1871, and at first the constitution of the department was gradual. In due course, however, all the hotels were grouped under one general oversight and management, the refreshment rooms and restaurant cars naturally becoming associated, and so the department was built up.

It may be mentioned that the Midland Hotel in Manchester, which now shares with the Adelphi, Liverpool, the premier position on the Midland system, was opened in 1903. Heysham Tower dates as a Midland Hotel from the completion of Heysham Harbour, and the inauguration of steamship services therefrom.

MIDLAND HOTEL, MANCHESTER.

Grand Hotel at St. Pancras was taken over by Mr. Towle, senior, in 1884, and in 1885 the Queen's Hotel, Leeds. In 1890, the Midland Hotel, Bradford, was opened. In 1892 the old Adelphi Hotel, Liverpool, was taken over, and in due course was re-opened in 1914 after being completely re-built. The

A complete list of the Midland hotels is as follows :—

Midland Grand—London, St. Pancras.
Midland—Manchester.
Midland Adelphi—Liverpool.
Queen's—Leeds.
Midland—Bradford.

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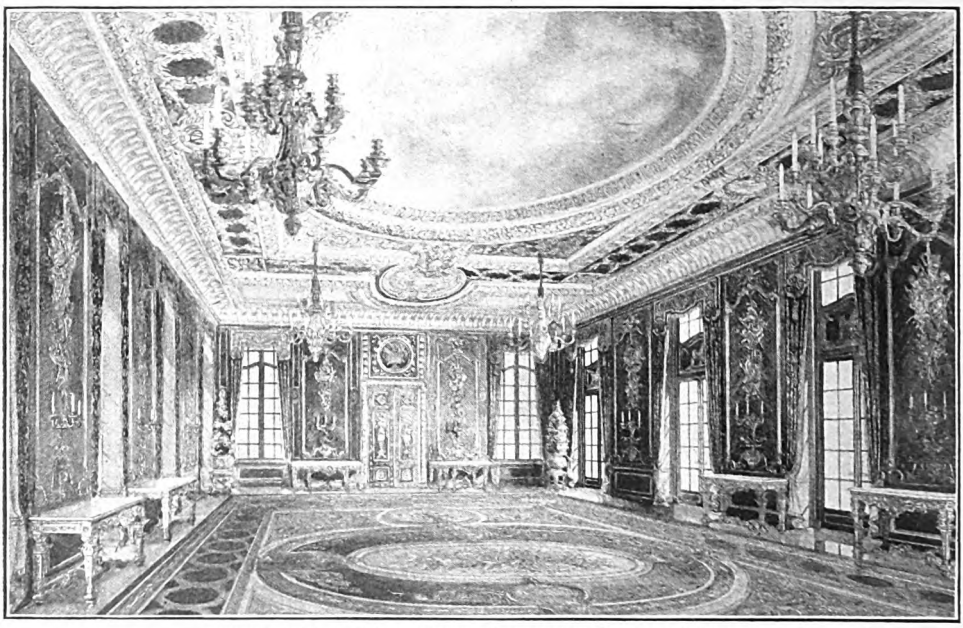
Midland—Derby.
Queen's—Keighley.
Midland—Morecambe.
Heysham Tower—Heysham.

The refreshment room department provides for all such accommodation throughout the system. The rooms are under the direct oversight of the joint managers, and supplies are maintained by the department. It is worthy of note that the first luncheon baskets were supplied from the hotel at Derby in the 'seventies, their introduction being due to Mr William Towle. Also he was largely responsible for the provision of third-class restaurant cars on trains, previous dining accommodation having been for first-class passengers only, and then frequently in the nature of buffets in the Pullman cars.

It is interesting to note that the Midland is the second largest user of restaurant cars, no fewer than 84 such vehicles being available. Under ordinary conditions, the summer arrangements give 50 services worked by the Midland Company only, 12 on joint routes and 2 worked by another company though Midland owned. In winter there are 45 Midland services and 10 joint. The totals are thus 64 or 55. On Sundays there are 10 services.

The two "foreign" services referred to are the restaurant car expresses inaugurated on July 1st, 1913, by the North Eastern Railway between Sheffield (Midland station) and Bridlington, using the Midland line as far as Swinton. The joint trains, under Midland management, include eight Midland and Glasgow and South Western, working between London and Glasgow in the case of three double journeys, and between Manchester and Glasgow for the others, with four Midland and North British, working between London and Edinburgh. The longest daily journey is between St. Pancras and Glasgow, 424 miles.

Cross-country restaurant car travel is confined to the West of England main line, the most usual journeys being those of the Bristol and York and the Nottingham and Bournemouth expresses. Beyond these trains the working of restaurant cars on the West of England line is confined to the Derby and Bristol section, over which an ample service is run.



DINING ROOM, MIDLAND ADELPHI HOTEL, LIVERPOOL.

Several types of cars are in use. For lighter services the kitchen and pantry are placed in the centre with open or semi-open saloons on either side, respectively first and third class. In some instances the kitchen and pantry are at one end, and the remaining space forms one saloon (or two saloons, smoking and non-smoking), in which class distinctions are not observed. There are a few instances, too, where the kitchen forms

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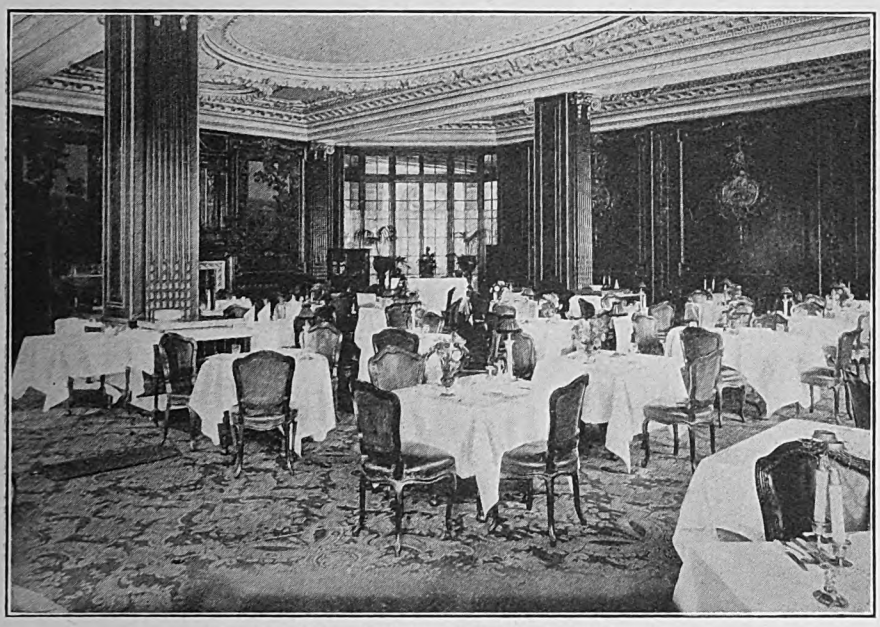
part of a corridor car, tables being set up in the compartments.

The more general arrangement is to run at least two cars, one first class and kitchen, and the other third-class, the internal space being further divided into smoking and non-smoking. On the Midland Railway passengers are usually allowed to use the cars as ordinary travelling accommodation, and this is coupled with the practice of serving all kinds of incidentals while travelling. Thus, a passenger is able to obtain a meal of a suitable kind at any period of a journey, and the writer has to acknowledge the convenience of such a system where he has had occasion to change before a recognised meal time, and the absence of facilities for obtaining refreshment conveniently thereafter rendered it desirable to make use of the opportunity afforded by the Midland system. Naturally, at times when *table d'hôte* meals are being served passengers are expected to take advantage of these; but the more general facilities also usually available are highly appreciated by most travellers. At times relays of meals are necessary, but as a rule accommodation is proportionate to anticipated requirements, and there is little duplication of seats where passengers occupy the restaurant car between meal times.

Direction of the whole department is centralised at St Pancras, under the joint managers, Messrs. Frank and Arthur Towle; and these gentlemen have realised a degree of personal oversight which is somewhat remarkable. Both have had a comprehensive training, and their capability is shown by the fact that Mr. Arthur Towle is at present in single-handed control, the services of Mr. Frank Towle having been required by the War Office as Assistant Inspector of Quarter-Master General's Services on the Headquarters' Staff of the Southern Command, with the rank of Staff Captain.

Both of these gentlemen had public school educations at Marlborough College, but whereas Mr. Frank Towle proceeded to Trinity College, Cambridge, his brother spent several years travelling, gaining experience in hotels in America and on the Continent. They entered Midland Railway service in 1896, and on August 5th, 1898, became joint assistant managers, under their father. On April 21st, 1911, they were associated directly with Mr. William Towle as joint managers, and on his retirement they took over full control jointly.



DINING ROOM, MIDLAND HOTEL, MANCHESTER.

As indicated, a strong point has always been made of "personality of direction," and in normal times one or other of the managers visits each of the principal hotels at least once a week, and the others frequently. Therefore they are able to deal personally

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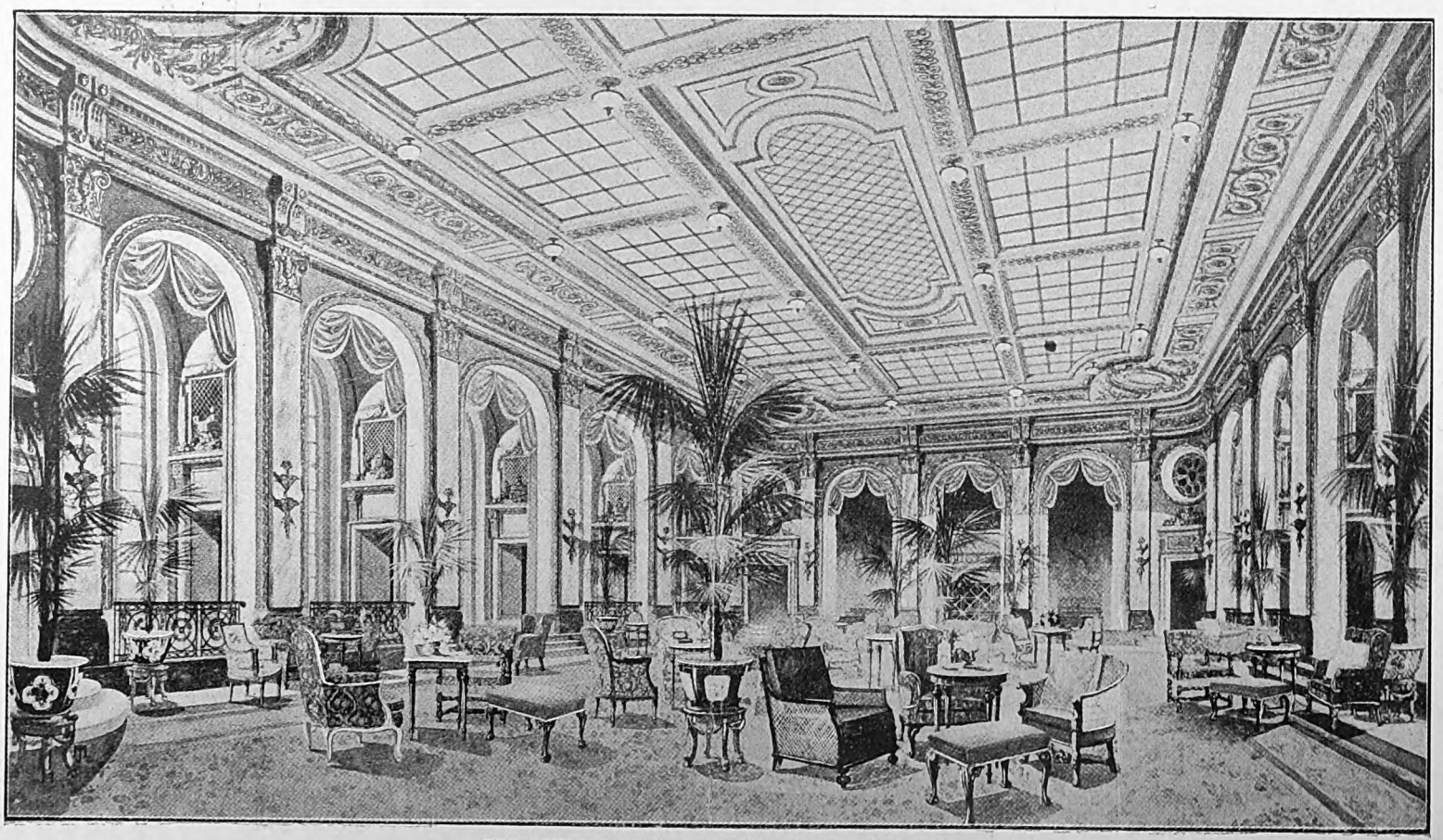

THE COURT, MIDLAND ADELPHI HOTEL, LIVERPOOL.

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with most matters which arise, reducing correspondence and the like to a minimum.

In the large hotels there are usually both a Superintendent and a Secretary. The former is in general charge, and is responsible for discipline, management of staff, reception of visitors, and in other ways for the maintenance of the desired standard and regulation of the hotel. The Secretary deals with the business matters, and is the holder of the hotel license where a resident licensee is insisted upon. At the smaller hotels the Resident Superintendent combines both offices, though frequently the license is held in the name of the Secretary of the Railway Company.

Some remarks in reference to the stores may be mentioned. These are in London, adjacent to St. Pancras station, and everything which can be so dealt with is supplied therefrom. Most of the restaurant cars are served from one or other of the hotels, the principal exceptions being the services to points at which the Company do not own hotels, which have to be supplied, at one end, either from hotels of other companies, or in other ways as may be arranged. Where an hotel is available, the refreshment rooms are also supplied through the same medium; otherwise the refreshment room is conducted on its own responsibility; but still in direct association with headquarters.

Although, however, the department as a whole is directed from London, the accounts office and wine cellars are at Derby, as accommodation was provided for them there before the headquarters were removed to London.

Supplies of all kinds are generally purchased in the open market, and personally selected by the managers. In several instances final stages of preparation are undertaken by the department. Thus, tea and coffee are blended under the personal inspection of the managers. At London, too, there is a printing office devoted entirely to the printing of menus, hotel stationery, advertising bills, notices, etc., and other work of the kind. Here a great deal of high-class work is done, the menus and the like issued for special functions being frequently veritable works of art.

In London, Messrs. Towle have for their principal assistant, Mr. F. G. Cooling, who, as chief clerk, assists them generally in the indoor work and the organization of the department offices. Mr. Cooling has a clerical staff of about 25 men in normal times, though at present a number of women clerks are employed in place of those serving with His Majesty's Forces. At Derby, Mr. E. Clulow, with a staff of 30, is in charge of the hotels accounts office. Both of these gentlemen have had long experience in the department, the former of 21 years, and the latter of 30 years.

The Superintendent of the Midland Adelphi Hotel in Liverpool at the moment is Mr. E. Cooke, while his "chef"—an exceedingly important office in these great caravanserais—is Mons. Mestivier, at present serving in the French Army. In Manchester, Mr. J. Morrison is Secretary and Mons. Colbert is Superintendent. At St. Pancras the Superintendent is Mr. Belfield, while in Mons. Briais the Company has a chef whose productions are well known, while he himself already records 40 years' service with the Midland Railway.

The restaurant car services are under the direction of a Staff Superintendent, his work being the management of the staff and other matters entailed. There are also travelling inspectors of refreshment rooms. All members of the responsible staff have been with the Company for many years.

It may be mentioned that at an early period in the war all eligible single men of military age were released from the department, amounting to over 600 men, a number having received commissions. Their places have been filled by older men, or by women; and under Lord Derby's scheme all who were affected have been attested.

New conditions have entailed various changes, but in regard to restaurant cars, refreshment rooms and hotels the policy has been systematically adopted of maintaining standards of catering and equipment, slightly increased charges being made where absolutely necessary to attain this end but not otherwise, and only as far as justified on this ground. There are a few exceptions in which no change has been made, though that course would be economically justified. Thus, the standard half-crown luncheon in third-class restaurant cars, perhaps the most widely supported meal available on the system, remains as before, as it appeals so largely to the commercial world and to soldiers travelling by rail.

Since the outbreak of war, to meet the needs of the large numbers of soldiers and sailors travelling by train, a special tariff has been arranged for men in uniform. Thus in first-class refreshment rooms a cup of tea or coffee can be had for 2d., or 1½d. in third-class rooms. Similarly, a lead was given by

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the Midland Company in supplying in the trains tea trays—cup of tea and bread and butter—at 4d. to members of His Majesty's Forces, while special prices for soldiers and sailors apply generally.

But whatever the application be, the policy is strongly insisted upon, that the best material is to be provided and a fair price charged. This applies from the highest standard to the cheapest, and its observance has undoubtedly been mainly responsible for the high reputation which the Midland Railway now possesses in respect of catering for the physical needs of travellers. Its realisation is seen in all branches. In the French restaurants in the hotels at Manchester and Liverpool it is claimed that the style and standard is the same as that of the best restaurants in London or Paris; and yet the prices charged are quite reasonable. In the popular cafés, such as that at St. Pancras, the same ideal is aimed at—best

HER MAJESTY'S DINNER.

MIDLAND HOTEL, DERBY,
September 28th, 1849.

POTAGES.
Crême de riz
A la Julienne.

POISSONS.
Le turbot sauce homard
Les rougets al Italienne
Les soles frites.

RELEVES.
Le janbon
Les poulèts au riz.

ENTREES.
Les pigeons aux pois
Des riz de veau panés
Des cotelettes de mouton
Vol'au vent de ragoûs.

ROTS.
Poularde Perdreaux
Les sarcelles.

ENTREMETS.
La tartelettes de comfitures
La gelú de fruits
La charlotte depommes
Le pudding de biscuits.

SIDE TABLE.
Roast beef
Roast mutton.

Bouillic gratiner.

INAUGURAL BANQUET.

MIDLAND ADELPHI HOTEL, LIVERPOOL,
INAUGURAL BANQUET,
March 14th, 1914.

Caviar D'Astrakan aux Blinis
Bénédictines roses.

Pot au feu côte D'Azur
Crème Reine Margot.

Suprême de sole Mercédes.

Zephirs de jambon de Prague aux Xérès.

Selle D'Agneau à L'Infante
Petits pois à la Française
Pommes Suzette.

Granite grande Chartreuse.

Pousin de Hambourg Belle Meunière
Salade des Gobelins.

Asperges au Beurre D'Isigny.

Timbale de pêches Mireille
Delices Parisiennes.

Fruits Serre Chaude.

Moka.

Examples of special menus supplied at Midland Railway Hotels: 1849 and 1914.

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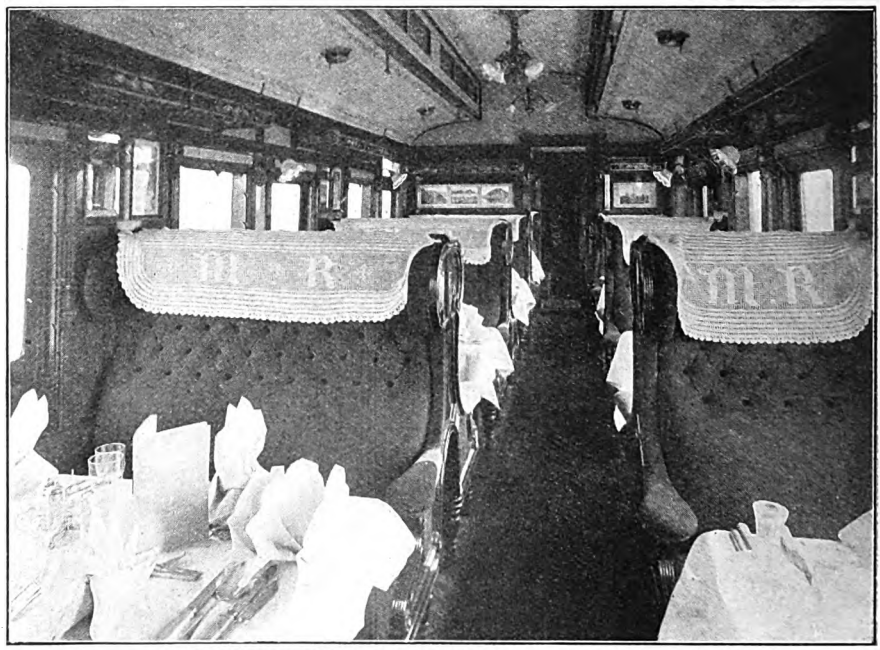
both in Liverpool and Manchester the Midland hotels obtain their full patronage, and it may be stated that during a recent week at the latter some 10,000 meals were served, the number of visitors being about 1,800.

As showing the great changes which the years have produced, a menu served to Queen Victoria at the Midland Hotel, Derby, is reproduced, and this may be compared with one used for the inaugural banquet on March 14th, 1914, when the enlarged and reconstructed Midland Adelphi Hotel was opened, both being of a special character, and representative of the highest standards according to the ideas of the respective periods.

A few remarks in reference to the hotels controlled by Messrs. F. and A. Towle will now be in order.

The "Midland Grand," as it is generally termed, at St. Pancras is more essentially part of the station than any other great railway hotel, and one cannot consider one as distinct from the other. It was at one time contemplated to remove the headquarters of the railway from Derby to London, but this scheme did not mature and, to the great advantage of the hotel, the whole of the premises fronting the station proper, except for the offices of the hotels department and some district and station offices, is given over to the hotel.

The building, considered to be the most architecturally interesting in London, was designed by Sir Gilbert Scott. It was said that he entered the competition promoted by the Midland Railway mainly in consequence of his being detained in London by the illness of a member of his family. Be that as it may, and notwithstanding that his design was not fully carried out, the building being a storey lower than intended, we have in St. Pancras the most interesting station erection in the Metropolis. Moreover, while architects do not "enthuse" over most of the railway hotels, and they are usually prolific of schemes for "improvement," they are almost unanimous in their approval of the "graceful spires and clock tower" and the porch and "splendid Gothic façade" at St. Pancras.



INTERIOR OF FIRST-CLASS DINING CAR: MIDLAND RAILWAY.

Internally the hotel is equipped in modern style, and is a favourite rendezvous for business men and general travellers. It is, moreover, a favourite meeting place for railway officers of all companies when in London, than which a greater compliment can hardly be paid. There are 300 bedrooms.

The Midland Hotel in Manchester, opened in 1903, is regarded as one of the "sights" of the city. It is certainly a wonderful

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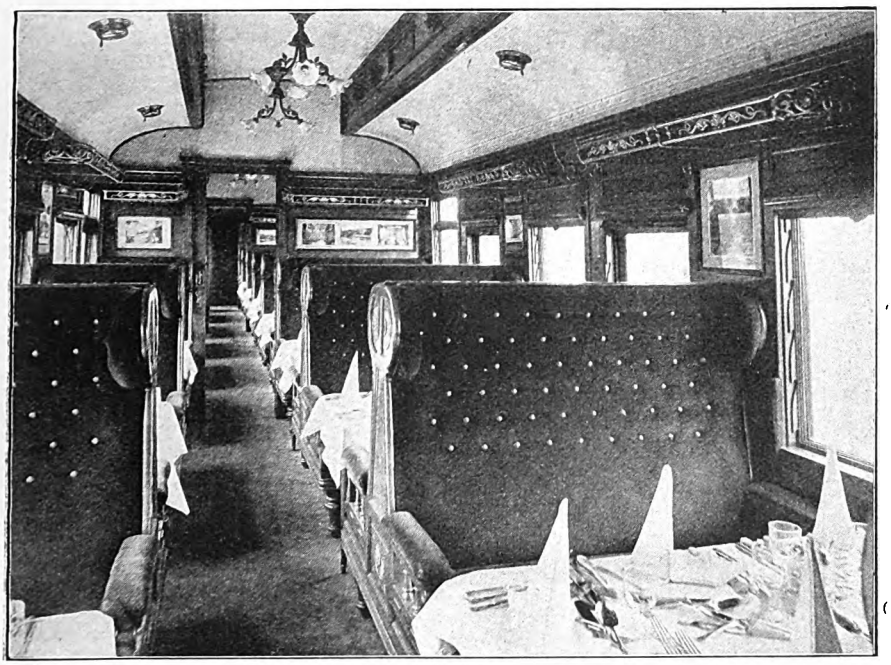
building, and is characterised by provision for meeting the ideas of visitors familiar with customs of many countries.

It is, however, the Midland Adelphi in Liverpool which now claims pride of place among Midland hotels, and a short description thereof will be of interest.

The first Adelphi Hotel was a somewhat squat, three-storied building of the Georgian style of architecture much in vogue in 1826, when it was built. The hotel soon became popular and of established reputation, evidenced by the fact that fourteen years later Charles Dickens stayed here *en route* to America.



INTERIOR OF THIRD-CLASS DINING CAR: MIDLAND RAILWAY.

The history of the Adelphi Hotel during the Victorian era may be said to be the history of Liverpool. Commerce and shipping increased beyond the dreams of the most sanguine; and just as the name of Liverpool finds prominent place in the commercial renaissance of Great Britain, so also is the Adelphi inseparably associated with the extraordinary progress of the city.

The hotel was the favoured "stopping place" of the Royal Family when visiting or passing through Liverpool; Princes of Foreign Royal Houses have honoured it with their presence; Ambassadors from Washington have made it their home when going or returning from their missions; and indeed there have been but few visitors of importance to Great Britain by way of the Mersey who have not stayed at the Adelphi.

From its inception right onwards the hotel has enjoyed remarkable favour with visitors to Europe from the States. Its position—some ten minutes' ride through the city from the point of disembarkation and convenient for the Midland and London and North Western Railways—may account for some of this unbroken record of popularity. Enlargement and additions became necessary from time to time until in 1876, to meet the requirements of the ever widening circle in its *clientèle*, the hotel was entirely rebuilt and a magnificent edifice replaced the smaller building.

During this period the Midland Railway had been extending its commercial and industrial relations, and in view of its close association with Liverpool they decided to build or secure a hotel near the Liverpool terminus to cater both for local needs and for the accommodation of passengers.

Negotiations were entered into, and in 1892 the Company acquired what had then become the world-famous Adelphi. From that time onwards the hotel met with

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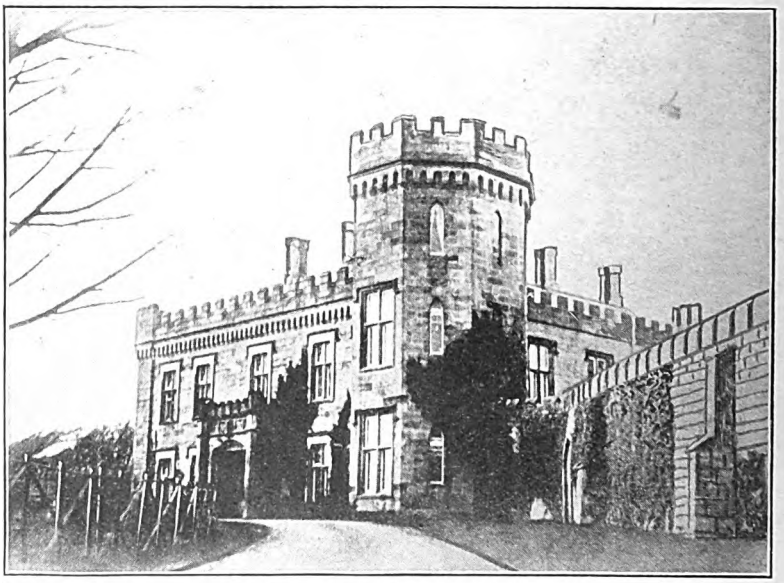
continued and ever-increasing support, until it was found absolutely necessary to again considerably extend the resources of its accommodation; and some three or four years ago it was decided to still further enlarge, and, in fact, to entirely reconstruct the building. The result of this decision is found in the New Midland Adelphi, which cannot be classified as other than absolutely the highest standard yet attained in hotel construction.

The architect was Mr Frank Atkinson, F.R.I.B.A.; and while the exterior of the building is remarkable for its dignified simplicity, the interior has also been designed throughout—to the smallest detail—by this well-known draughtsman. The building is externally in white stone, and gives an impression of artistic solidarity which goes well with its reputation for internal equipment and accommodation.

Equipment includes electric lifts, telephones in every room, private bathrooms to nearly all rooms on the first four floors, Turkish baths, swimming bath, tennis courts, squash racquets courts, shooting galleries, etc. The restaurant has been carried out in the Louis Seize period of decoration and furnishing.

The main entrance court is approached by a wide marble staircase. It leads into the Hypostyle Hall at the higher end, and on the right and left the dining room and French restaurant are entered through doors carved and glazed. Small raised balconettes are arranged on either side of the court. The walls are treated with decorative plaster, with breche rose marble pilasters with gilt capitals supporting the ornamental frieze. A handsome ceiling gives dignity to the room, and has a large decorative panel in the centre surrounded with glazed lights and finished with an entablature which is carried out to meet a richly ornamental cornice. A hand-made carpet of French design forms a lovely background for the settees and easy chairs, which are antique in form but eminently modern in their luxurious resiliency. Small tables are placed in convenient positions, and the cleverly reflected light throws soft shadows into the old gold silk draperies which give warmth and comfort to this handsome room.



HEYSHAM TOWER, HEYSHAM.

The walls of the French restaurant are panelled with sycamore finished to a beautiful tone of silver grey, and inlaid with choice woods of specially selected quality. The plan of the room is oblong, with semi-elliptical ends. At the four corners are alcoves, the walls and ceiling of which are decorated with gold treillage.

The hangings and coverings are of silk of a delicate shade of rose colour. The carpet, in which rose is also the predominating colour, is of the same bold design as the richly-modelled fibrous plaster ceiling. The

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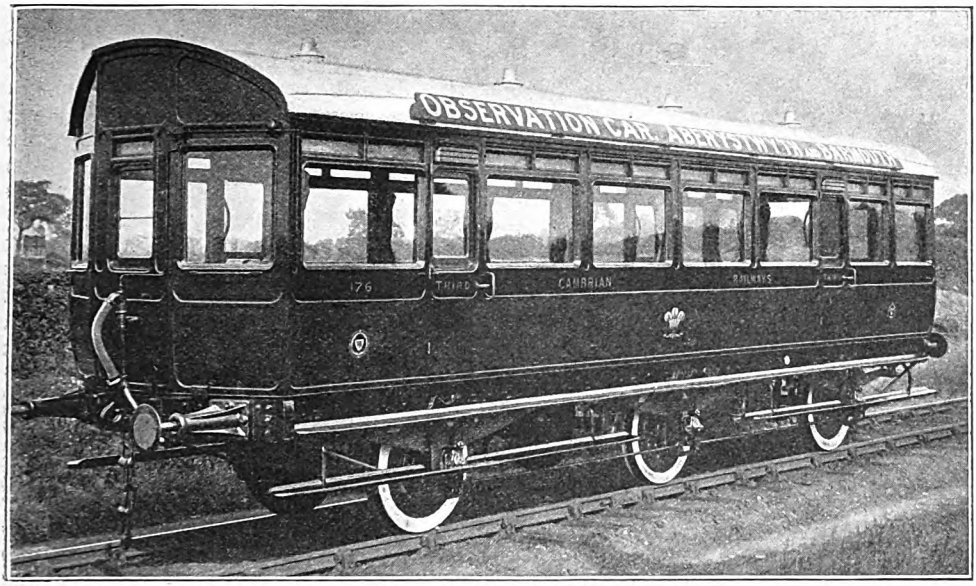

OBSERVATION SALOON RECENTLY INTRODUCED ON SCENIC ROUTES: CAMBRIAN RAILWAYS.

The Whitchurch-Aberystwyth Main Line Section of the Cambrian Railways.

By REGINALD H. COE.

THE main line section of the Cambrian Railways from Whitchurch to Aberystwyth, a distance of a little short of 100 miles, is in many respects one of the most fascinating stretches of railway to be found in these Isles. Certainly it is unsurpassed in beauty, and the wild grandeur of the scenery the whole of the way is unexcelled.

In addition to the attractions which nature provides for those who journey by the Cambrian Railways from the English border to the rugged Mid-Welsh coast, there are many features about the route which render it particularly attractive to the "Railwayist." One is that for a greater part of the distance the line is single and worked on the electric "tablet" system, whilst the hilly and even mountainous nature of the country traversed makes the line in reality one long switchback, with a constant succession of steep and trying gradients.

The Cambrian main line commences at Whitchurch—where a junction is made with the London and North Western line from Crewe and the North of England. Through trains from Liverpool, Manchester, Leeds, etc., to the beauty spots of Cardigan Bay and Mid Wales proceed this way, whilst passengers from the Midlands and the South join the Cambrian at Welshpool. Whitchurch is a typical country junction. There is a fairly large engine shed at which both North Western and Cambrian engines are stabled. The first important station after leaving Whitchurch is Ellesmere, the junction for Wrexham. Ellesmere has been described as the "Killarney of the Midlands." Within a radius of five miles there are seven meres, the largest of which lies close to the parish church and is 116 acres in extent—a beautiful piece of lake scenery.

Incidentally the through Great Central trains from Manchester to Aberystwyth strike the Cambrian at Wrexham, and it is worthy of note, in passing, that the Cambrian Railways is tapped by no less than four of the Great English systems: London and

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North Western, Great Western, Midland, and Great Central.

A few miles beyond Wrexham the railway reaches Oswestry, a thriving border town, and the headquarters of the Cambrian Railways. It is here, also, that the engines and rolling stock generally are kept in repair. The town itself boasts a population of about 10,000, a large number of men being kept in regular employment at the railway works. The station is a good one, with a fairly large running shed near by.

The next station past Oswestry is Llynclys, the junction for Llangynog, and after that comes one of the most curiously named stations in the British Isles—Pant. Next is Llanymynech from which branches the line to Llanfyllin, the nearest station to the Liverpool Corporation Reservoirs at Lake Vyrnwy.

After a few more stations have been left behind, Welshpool Junction is reached, and the North Western and Great Western Joint Line from Shrewsbury joined. Welshpool is a small but picturesquely situated station about 16 miles south of Oswestry, and exactly 20 from Shrewsbury. It is also the starting place of the branch line to Llanfair Caereinion. There are two engine sheds just outside the station, between them stabling the engines of the three lines concerned. The town of Welshpool is well worth a visit and contains many interesting sights. The population is about half that of Oswestry.

Leaving Welshpool the line at once plunges into characteristic Welsh scenery, and after running through the wayside station of Forden, Montgomery is reached. This is a pleasantly situated town, and has a resident population of about 1,000.

RHEIDOL VALLEY, SHOWING THE "WHITE STAG," NEAR ABERYSTWYTH.

Abermule, the next stop, is the junction for the Kerry Branch. Kerry, by the way, is the most convenient centre for visiting the historic and romantic Offa's Dyke. The next station is Newtown with a population of about 5,000, and is the centre of the Welsh woollen industry. Then comes Moat Lane, a very important junction on the Cambrian system. The line to Rhayader and Brecon diverges to the left here, and by means of this latter line connections are made to all parts of Mid and South Wales.

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The station at Caersws stands upon the site of a Roman Fort, and recently the village was the scene of extensive excavations by the Archæological Authorities, numerous relics being discovered, a number of which are preserved in the local museum. From Caersws the little line known as the "Van Railway" starts. It runs to the Van lead mines, about 7 miles away, but does not convey passengers.

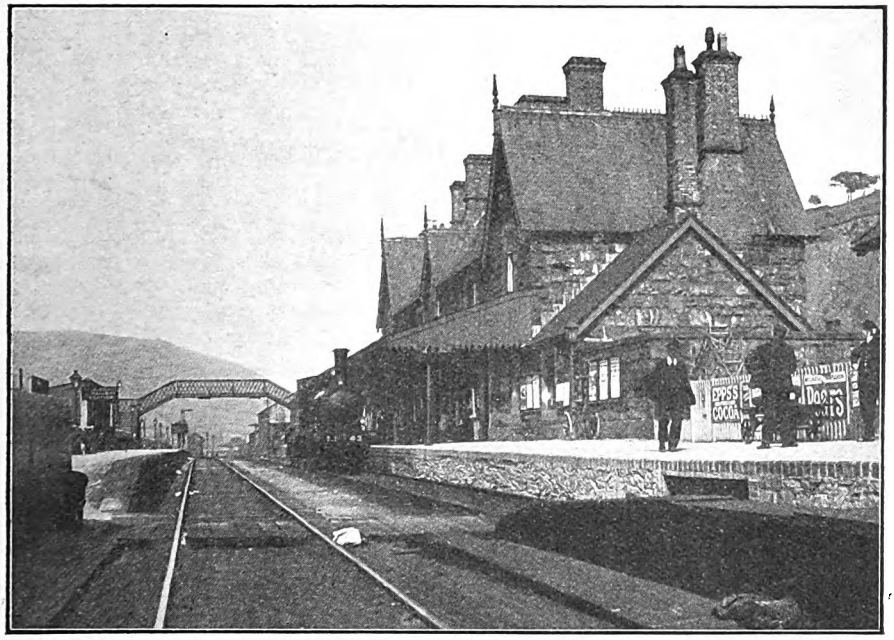
A number of small stations are passed in the next 20 miles, some of which make up in unpronouncable names what they lack in size and importance.

Eventually Cemmes Road is reached, the junction for Dinas Mawddwy, and a few miles further on is the prosperous little town of Machynlleth. The town itself is of great antiquity, and was known to the Romans. This conquering race, in fact, had a camp here which they named "Maglona." The famous Welsh chieftain, Owen Glyndwr held a Council at Machynlleth which proclaimed him Prince of all Wales.

The River Dovey, which skirts the northern side of the town, is said to be the best salmon and trout river in Wales. It may be mentioned that the streets and roads of the town are for the most part wide and spacious and are nearly all lined with fine trees.

Machynlleth is the starting place of another Welsh narrow gauge line—the Corris Railway, which, after a most unique and delightful ride of some 6 miles, takes one within 3 miles of the awe-inspiring Tal-y-llyn Lake, and the stately Cader Idris. Plynlymon does not lie so very far from Machynlleth, and thus it will be seen the town is a splendid centre for holiday making.

After leaving Machynlleth the railway makes for Dovey Junction, where the traveller obtains his first glimpse of the sea, the view of which appears particularly attractive as seen from the carriage window. The line to Aberdovey, Barmouth, Dolgelley, Harlech, Criccieth and Pwllheli turns off here.



Photo] [*H. L. Hopwood.*

MACHYNLLETH STATION.

From Dovey Junction to Aberystwyth is about 17 miles, and a number of stations are passed, amongst them being Borth, which serves a quiet but growing village on the coast. The sands at Borth are especially noted for their firmness, whilst the excellent golf links are patronised by players from all parts.

The approach to Aberystwyth is very fine, the line coming straight out of a cluster of hills. Less than a mile from Aberystwyth station may be noticed on the left the toy-like track of the Vale of Rheidol branch, of which more anon. Outside the station itself junction is made

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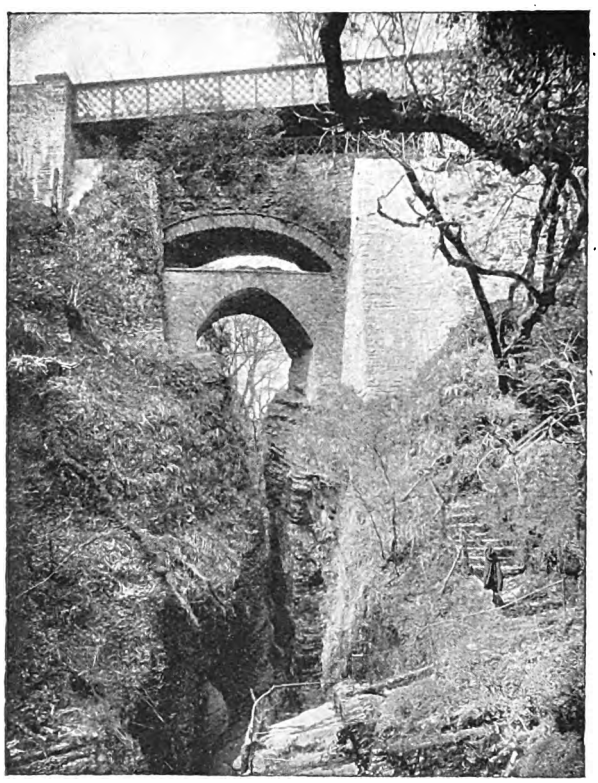

DEVIL'S BRIDGE, NEAR ABERYSTWYTH.

with the old Manchester and Milford Railway, now the property of the Great Western Company. This Manchester and Milford line obtained its name from the fact that it was originally constructed with a view to joining up "Cottonopolis" with the Welsh seaport, by connecting the Cambrian at Llanidloes with the Great Western at Pencader, but through lack of funds the scheme was abandoned and the line eventually diverted from Strata Florida to Aberystwyth, the present terminus. However, it retained its misleading but high-sounding title and even now is often referred to as the Manchester and Milford section of the Great Western Railway.

Aberystwyth station is rather small considering the size and growing popularity of the place, but it is stated on the best authority that before long it is to be rebuilt and enlarged. At present it consists of three main line platforms, for the Cambrian trains, and a double bay for Great Western trains. The exterior leaves nothing to be desired, and the building is in a convenient part of the town.

A few minutes' walk from the main station is the terminus of the Vale of Rheidol Branch. This line was taken over by the Cambrian Railway in 1913. It is one of the most fascinating of the many miniature railway systems of Wales. Near by are the engine and carriage sheds, these being substantially built brick erections.

On no account should the visitor to Aberystwyth miss the ride to the Devil's Bridge by way of the Rheidol Valley, for it is one of the most delightful trips imaginable. The distance is about 12 miles, and in this short space the railway climbs no less than 700 ft., giving, the whole of the way, a wonderful panorama of the beautiful Rheidol Valley. Three locomotives and a good number of passenger and goods vehicles of all descriptions serve to meet the normal requirements of this branch, although it has been found necessary in busy holiday seasons to add to the standard equipment.

Aberystwyth as a health resort is too well known to need much description here. Sufficient be it to say that it is delightfully situated on Cardigan Bay, well sheltered by the surrounding hills and possesses a lovely sweep of sea. The history of the town and of the castle ruins which frown over it dates back nearly a thousand years and is associated with some of the most stirring episodes in Welsh history. The castle was erected by Gilbert de Strongbow in 1107, but there was a fortified place here at a much earlier date. From the time of its construction right down to the exciting period when Owen Glyndwr swayed the destinies of Wales, the castle was the scene of incessant warfare, and it is doubtful whether any spot in Wales has a more exciting history. Aberystwyth is also a seat of learning, and the fine college which stands in a prominent place on the sea front is the oldest of the constituent colleges of the University of Wales.

In conclusion a little may be said about the locomotive work of the Cambrian Railways. The hilly nature of most of the routes, combined with the heavy loads which are a feature of the summer traffic, call for considerable engine capabilities, and travellers

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over the Cambrian Railways can be assured of witnessing some good engine performances. The principal types of the locomotives are of the 4–4–0 and 0–6–0 tender types, and these two classes, in fact, reign supreme on the main line. The most modern engines were built to the designs of Mr. Herbert E. Jones (the Locomotive Superintendent of the line), and present a very handsome appearance. They are painted black, lined with red, whilst the passenger coaches are painted a pleasing shade of green. Several old Metropolitan tank locomotives are now at work on the Cambrian Railways, being used chiefly for shunting, and these especially appeal to students of locomotive history. They are being reconstructed as tender engines, and one thus treated was illustrated in the RAILWAY MAGAZINE for January, 1916.

The Cambrian Railways also possess a number of 0–6–0 and 0–4–4 tank engines, which are used on the small branches, where the traffic is usually light.

During the summer months large numbers of "foreign" coaches work through to Aberystwyth, and vehicles belonging to the London and North Western, Great Western, Great Central, Taff Vale, and Lancashire and Yorkshire Railways are common sights there.

We may add that Mr. S. Williamson, the General Manager, has recently instituted many improvements on the line, including the provision of steam heating in the carriages on all the principal trains on the main line and coast sections; an experimental crossing place at Clatter, between Pontdolgoch and Carno, which has proved of great advantage in dealing with the tourist trains in the summer; and the running of fast non-stopping tourist trains between Whitchurch, Machynlleth and Aberystwyth. Last autumn two of the ordinary carriages were converted into observation cars in order that tourist and holiday passengers might view more easily the beautiful scenery on the coast section of the railway, and this facility will no doubt be much appreciated in the summer months. Holiday Contract Tickets have also been put into force on the Cardigan Bay Coast at a cost of only 1s. per day, covering Aberystwyth, Machynlleth, Dolgelley and Barmouth, and Dolgelley, Barmouth and Pwllheli. The districts covered by these tickets embrace the finest scenery in the principality. We understand that Mr. Williamson has under consideration other important schemes for the further development of the line, though, notwithstanding all this, probably the greatest service he has so far rendered the Company has been in the complete reorganisation and improvement of its finances, which have never been so satisfactory as at present

ABERYSTWYTH: PROMENADE AND CONSTITUTION HILL.

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Locomotive and Train Working in the latter part of the 19th Century.

THE GREAT WESTERN RAILWAY (Standard Gauge).

[No. II.]

By E. L. AHRONS, M.I.Mech.E., M.I.Loco.E.

(*Continued from page* 196, *March* RAILWAY MAGAZINE.)

THE successors of the "Sir Daniels" as main line express engines were the larger 7 ft. singles of the "Queen" class with 18 in. by 24 in. cylinders. The first of these was No. 55 *Queen*, constructed at Swindon in 1873, which had a polished brass dome on the middle of the boiler barrel. This engine was for a number of years the one generally selected to run the Royal trains.

The remaining twenty engines of the "Sir Alexander" class were in general similar to the *Queen*, but the chief differences were that they had domeless boilers, and were without wedges for the driving hornblocks. These engines had a wheel base of 17 ft. 6 in. and the boilers had 1,145½ sq. ft. of tube surface and 133 sq. ft. of firebox heating surface, the total being 1,278½ sq. ft. The weight in working order was 33½ tons, of which 14 tons rested on the driving wheels.

Engines Nos. 55, 1117–1120, 1124–1126 and 1128 to 1132 were stationed in London, Nos. 1122 and 1123 at Gloucester, and Nos. 999, 1000, 1116, 1121 and 1127 came under the charge of the northern division, being stabled at Wolverhampton.

In addition to the *Queen*, four others bore names, viz. :—999 *Sir Alexander*, 1118 *Prince Christian*, 1122 *Beaconsfield* and 1123 *Salisbury*. From 1882 onwards they underwent as a class a greater assortment of boiler metamorphoses than probably any other main line express engines, either before or since. Nos. 999, 1000, 1116 and 1121 were rebuilt at Wolverhampton with closed splashers and domeless boilers, which were very similar to the original ones. All the sixteen engines in the southern division were rebuilt at Swindon in 1884–6 with boilers having domes on the front ring of a two-ringed barrel, whilst No. 1127 came out from Wolverhampton in 1887 with a boiler having a tall dome on the *back* ring of the barrel.

In the 'nineties all sorts of boilers were placed on them. No. 999 had one with a raised firebox and a tall dome, and No. 1000 a raised Belpaire firebox and a large dome of considerably greater diameter. Some, like Nos. 1122 and 1129, were rebuilt with domeless Belpaire boilers of the "Camel" pattern, the fireboxes being raised above the barrels. A few retained the old standard type of 1884 Swindon boiler.

For a short time in the 'nineties, four more of them bore names as follows :—1119 *Prince of Wales*, 1128 *Duke of York*, 1129 *Princess May*, and 1130 *Gooch*. These names, however, were subsequently removed between 1894 and 1902, but Nos. 999, 1118, 1122 and 1123, bore their original time-honoured names to the last. All were broken up between 1903 and 1907, except No. 1128, which still survives at Oxford, where it is employed on the Fairford branch.*

The other ten 7 ft. express engines were the celebrated 157 to 166 series, built in 1879 at Swindon, except No. 159, which came out in 1878. Like the "Sir Alexanders" they had domeless boilers, 7 ft. driving wheels, and 18 in. by 24 in. cylinders, but otherwise they were very different engines. The wheel base was 17 ft. 8 in., being 2 in. longer than the 999 class. The boilers were not quite so large, having 1,214¼ sq. ft. of heating surface, of which the firebox provided 115 sq. ft. But the grate area was somewhat larger, 19·3 sq. ft. as compared with 18 sq. ft. of the 999 class. The weight

*Since this was written No. 1128 has been broken up.

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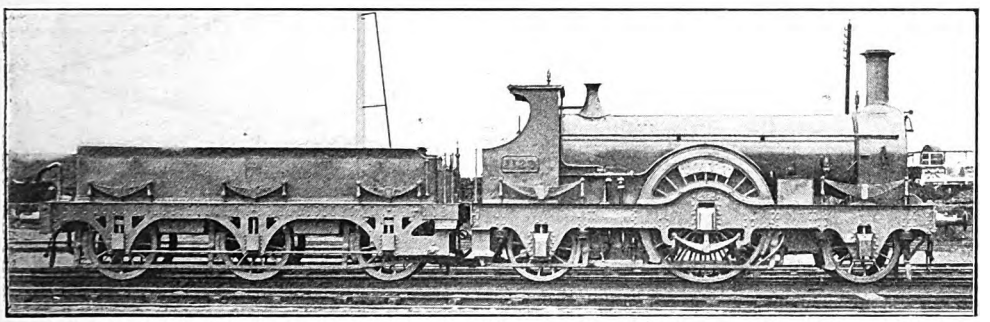
was 36 tons 3 cwt., and 16½ tons was carried on the "drivers." I might add here that the weight of the 999 class was increased after they were rebuilt to about 35 tons.

The principal difference between the two classes was that Nos. 157 to 166 had the old broad gauge form of sandwich frames. In connection with this type of framing, I may mention that it always seemed to enable the engines to ride more smoothly over the old longitudinal "baulk" road of the Great Western, Until the conversion of the broad gauge in 1892, the whole of the main line from London to Exeter was laid with longitudinal sleepers, also the piece from Didcot to Oxford, and nearly the whole of the Swindon-Gloucester and Chippenham-Weymouth roads. North of Oxford as far as Wolverhampton there was a considerable amount of "baulk" road, but a large part was laid on the usual transverse sleepers. The "baulk" road was very stiff, and the engines made what I may term very "dead riding" over it, so much so that the drivers used to say that the engines were "two coaches better" when travelling over the transverse sleeper sections.

But a few short lengths of the latter road on the Great Western Railway left something to be desired. Between Oxford and Leamington, especially near Fenny Compton and down the Harbery bank, the engineering department had economised rails by turning over the old ones, which were of the double bull-head pattern, so that the lower portion of the rails which had been resting in the chairs, became the top running surface. In their original position the chairs had made slight indentations into the rails, and after they had been turned over, the effect of these was very strongly marked, and produced a continual chattering sensation on the footplate. The result was so uncomfortable and jarring that the experiment of "turned rails" was abandoned

Returning to the 157–166 class, I have always considered that in their original condition, as they ran from 1879 until 1886–7, they were the most handsome express engines that were ever built. The large open splashers, which were not hidden by the driving springs, for the latter were underhung, were surrounded by a broad band of polished brass, and I know of no engines that gave the observer such an impression of "greyhounds." They always appeared to be faster runners than the "Sir Alexanders," but for some reason the latter always seemed slightly the more powerful. In 1886–7 their outside appearance was modified. Open splashers had been universally condemned on all railways, as some nasty accidents had occurred owing to the drivers putting their arms through the spokes of the driving wheels in order to get at the "big-ends" more easily. The result was that the 157 class lost their beautiful brass bands, which were replaced by closed splashers painted brown. At the same time the six engines stationed at London, Nos. 158–9, 162–3, and 165–6, which came under Swindon supervision, had brass domes added by cutting holes through the middle rings of the boiler barrels. When rebuilt at Swindon a few years later, their appearance was not much altered, the only difference being that the domes were placed slightly further forward.



999 CLASS, 7 FT. SINGLES. CYLINDERS 18 IN. BY 24 IN. BUILT AT SWINDON, 1875.

Nos. 157, 160, 161, and 164 were stationed at Wolverhampton. Of these No. 161 was rebuilt in 1886 with a domeless boiler similar to that of No. 999, but the other three in 1886–7 received boilers like No. 1127, with tall brass domes placed far back on the second ring of a two-ringed barrel. All the class subsequently underwent similar boiler changes to those of the 999 class. No. 157 had a boiler with a raised firebox

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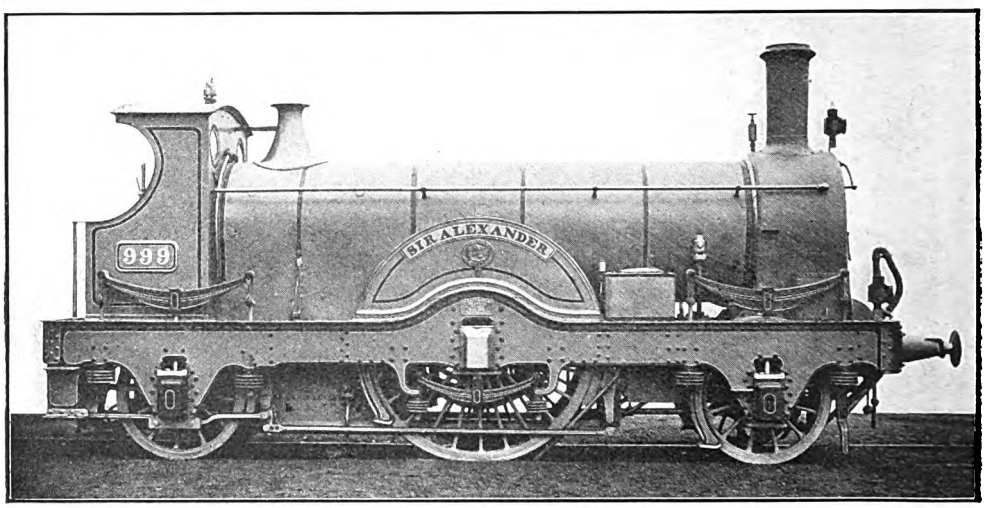
and tall dome, and Nos. 159, 163 and 165 received domeless Belpaire boilers of the "Camel" pattern, similar to No. 1122, etc.

In the "'nineties" No. 162 was given the name *Cobham*, and was the only one of the class to be named. I regret to have to add that all have been broken up, the last survivor, No. 165, having been, together with 1128, employed on the Oxford and Fairford branch.

As mentioned previously, almost the whole of the main line express work was performed by the 999 and 157 classes. Their stations have already been mentioned; twenty were at London, two at Gloucester, and nine at Wolverhampton. The two Gloucester engines, 1122 and 1123, were in 1887 transferred to Swindon owing to a change in the locomotive working.

bring down the 5.45 p.m. Milford boat express, with which they did not reach Gloucester until about 8.30 p.m. This was a very long day's work, so that in 1887 the working of these trains was transferred, together with the engines 1122 and 1123, to Swindon. At the same time I should add that they had four or five hours' rest at London.

The Wolverhampton engines were employed exclusively between there and London, and they had about four turns to Paddington. Generally they ran *viâ* Banbury, but on some turns they would travel up *viâ* Worcester and return *viâ* the main line. Trains north of Wolverhampton were not worked by the 999 or 157 classes, and I believe it was exceedingly rare for them to be seen in that direction.



999, *Sir Alexander*, REBUILT AT WOLVERHAMPTON.

The London engines had four or five daily trains, the South Wales expresses, as far as Swindon, but they did not work regular trains to Bristol, although they very occasionally ran there with specials. On Sundays only they worked a train to Gloucester and back. They had three express turns to Wolverhampton, with one of which they returned with the up "Northern Zulu." At a later date they also ran to Wolverhampton *viâ* Worcester and the West Midland line. The same link also worked other trains as far as Oxford both *viâ* Didcot and *viâ* High Wycombe.

The two Gloucester engines worked up to London on alternate days with the 8.0 a.m. from Gloucester (9.5 a.m. from Swindon). On this turn they had to wait at London to

A few examples of the performances of the 999 and 157 classes may be of interest. Nearly all these were recorded by me between 1885 and 1892, and in comparing them with present day work readers of the RAILWAY MAGAZINE should keep in mind that there were but a very limited number of runs in the whole country at that time which were booked at 50 miles per hour or more. Nearly all the best express work of that period was booked to be performed at a running average of 46 to 49 miles per hour.

With No. 1125 on the 3.55 p.m. up from Swindon (South Wales express), a train which stopped at Didcot and Westbourne Park only, we had a load of 180 tons, and ran from the dead start at Didcot to a signal stop near West London Junction, 50¾ miles,

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157–166 CLASS, 7 FT. SINGLES. CYLINDERS 18 IN. BY 24 IN. BUILT AT SWINDON, 1878–9.

in exactly the even hour. This was a very good performance for a "single" engine of only moderate size with a comparatively heavy load.

With engine No. 1124 and 165 tons on the 5.45 p.m. down Milford boat train, which was booked to run from Paddington to Swindon in 97 minutes, the running was as follows:—

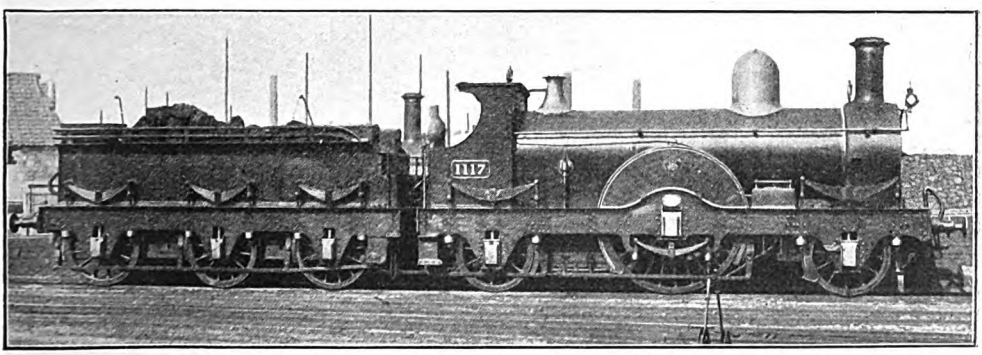
Miles					Speed m.p.h.
—	Paddington	dep.	5.46. 0	due 5.45..	—
18½	Slough ..	pass	6.11. 8	.. ..	44·2
24¼	Maidenhead	,,	6.17.48	.. ..	51·1
36	Reading ..	,,	6.31.40	.. ..	
53⅛	Didcot ..	,,	6.50.50	.. ..	53·6
77¼	Swindon ..	arr.	7.21.36	due 7.22..	47·1

Nearly 1½ minutes were gained by the engine.

One very interesting record which I possess was a "narrow gauge" attempt to perform the Paddington–Swindon run in the broad gauge "Dutchman" timing of 87 min. It was just before the Easter holidays, and the 3.0 p.m. broad gauge "Zulu" was run in two portions, of which the second part was a "narrow gauge" express to take all passengers for stations as far as and inclusive of Exeter.

The engine was No. 1123 *Salisbury*, and the load 195 tons, a particularly heavy one for that period. We passed Slough in 23 min. 22 sec. from the start, Maidenhead in 29 min. 55 sec., and Reading in 42 min. 30 sec. The speed as far as Reading from the dead start was 50·85 miles per hour. Signal slacks occurred between there and Didcot, but we ran from Didcot to Swindon, 24⅛ miles, in 27 min. 28 sec., an average of 52¾ miles per hour. It is obvious from this that time could not have been kept on a booked speed of 53¼ miles per hour, but then the load was 50 per cent. greater than the usual one of the "Dutchman" or "Zulu."

On the North road to Birmingham, only the 4.45 p.m. and the newer 9.55 a.m. from Paddington gave any opportunity for speed recording, as the other trains were only of a mediocre quality. With engine 166 on the 9.55 a.m. and a load of 100 tons, we left Oxford 1 min. 40 sec. late and reached Leamington 35 sec. before time, having run the 43 miles 46½ chains in exactly 48¾ min., a speed of 53·6 miles per hour. The best intermediate stretches were from the 79th post to the 87th post, 8 miles in 7 min. 46 sec., and from post 93 down the "Harbery" or Southam Road bank to post 104,



1117, 7 FT. SINGLE. REBUILT AT SWINDON.

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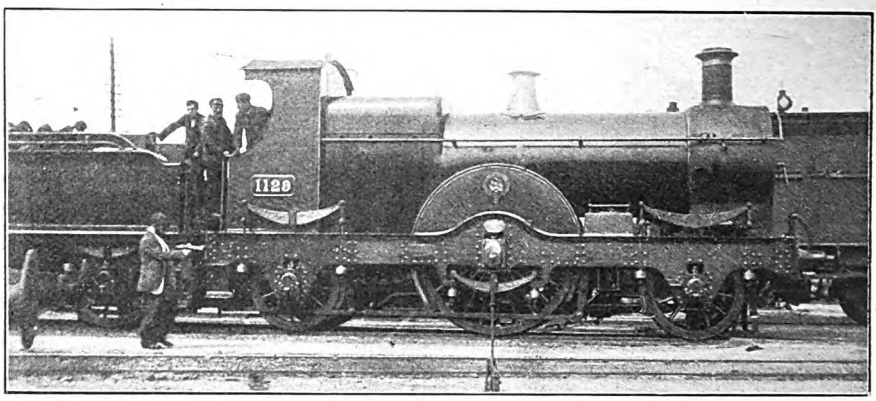
11 miles, in 10 min. 33 sec. The maximum speed was 70½ miles per hour from the 103rd to the 104th post. This train was run by a London engine.

The Wolverhampton engines always had charge of the 4.45 p.m. from Paddington. Now there was a small but important difference between the engines repaired at Swindon and those at Wolverhampton shops. The former had their valves set to "equal leads" for the front and back of the cylinders, whereas the Wolverhampton valve setter always (at that time) set the valves to "equal port openings" front and back. And speaking from my own experience, and I travelled hundreds of miles on the footplates of most of the 7 ft. singles, the Wolverhampton engines were certainly the better both for pulling and running. On the 4.45 p.m. they gave me a large number of excellent performances, the best of which was by engine No. 1000 (Driver Hamer), who ran from Oxford to Birmingham with 120 tons, 65⅞ miles, in 69 min. 50 sec., an average speed of 56½ miles per hour. One coach weighing 20 tons was slipped at Leamington, through which station the speed was about 25 miles per hour. Although the booked time was 79 min., the run was usually done in considerably less, and I have records of Nos. 999 and 1121 in 71 and 72½ min. respectively. Only engine 160 would not gain time, as her driver was a great stickler for adhering exactly to the time-table, except when the load was somewhat greater than usual, when he was not quite so particular on the subject. The Wolverhampton express drivers of the 'eighties, Hamer, the two Smiths, Pickering, etc., knew how to handle a "single" engine with a heavy train in a manner which would make many coupled engine crews of the present day open their eyes, for single engines require men who have had experience of them and understand their peculiarities.



1129, 7 FT. SINGLE. REBUILT A SECOND TIME AT SWINDON WITH DOMELESS BOILER AND BELPAIRE FIREBOX.

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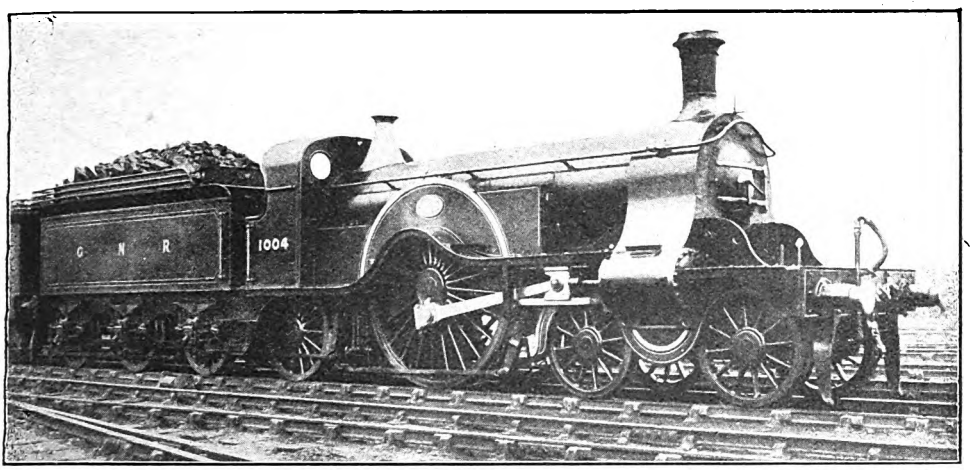

Photo] [*W. H. C. Kelland.*

GREAT NORTHERN RAILWAY.

"The Passing of a World-Famous Locomotive Design."
One of the last of the 8 ft. singles, No. 1004, at Peterborough.

British Locomotive Practice and Performance.

By CECIL J. ALLEN.

THERE are one or two letters from correspondents that require brief attention before turning to performance. The first, hailing from a Canadian friend now over here on military service, expresses the opinion that modern British express locomotives are not built with a capacity for raising steam and a tractive effort proportionate to their adhesion weight, as compared with the practices of Canada and the United States. He points out that the 4–4–2 engines of the Great Northern, North Eastern and North British Railways, and the latest 4–6–0 types of the Caledonian, Great Central, and London and South Western Railways have boilers of 5 ft. 6 in. diameter, but considers that, in view of the ample adhesion weight enjoyed by each of these types, they are under-cylindered, and have the "qualification for 30,000 lbs. tractive effort." In support of this contention he instances the 4–6–2 locomotive of the New Orleans and North Eastern Railway of the U.S.A., illustrated on page 419 of the RAILWAY MAGAZINE for December, 1915, which has also a 5 ft. 6 in. boiler, and 22 in. by 28 in. cylinders, giving a total tractive effort, at 85 per cent. of the working pressure, of 33,800 lbs., but an adhesion weight of only 130,500 lbs., or about 58¼ tons. That is to say, there are about 580 lbs. of nominal tractive effort available at the rail to every ton of adhesion weight.

On referring back to the article in question, which was entitled "Recent American Locomotives for Passenger Service," I find it expressly stated that the particular locomotive mentioned by my correspondent is "cylindered up to the limit of its adhesion." At the same time it is remarked that present American practice with superheater engines tends in the direction of large cylinders coupled with a relatively low ratio of adhesion, the writer adding further that the temperature of the steam is sufficient to eliminate condensation, even with a large external cylinder surface, so that high tractive forces can be developed while working expansively. But the sentence quoted above leaves no question that the engine mentioned by my correspondent is exceptional in its dimensions. An examination of the table of dimensions given at the conclusion of the article also makes this fact apparent. For example, the 4–4–0 engine of the Philadelphia and Reading Railroad has a tractive effort of 27,600 lbs. with an adhesion weight of 54 tons—on two coupled axles—giving only 510 lbs. effort per ton of

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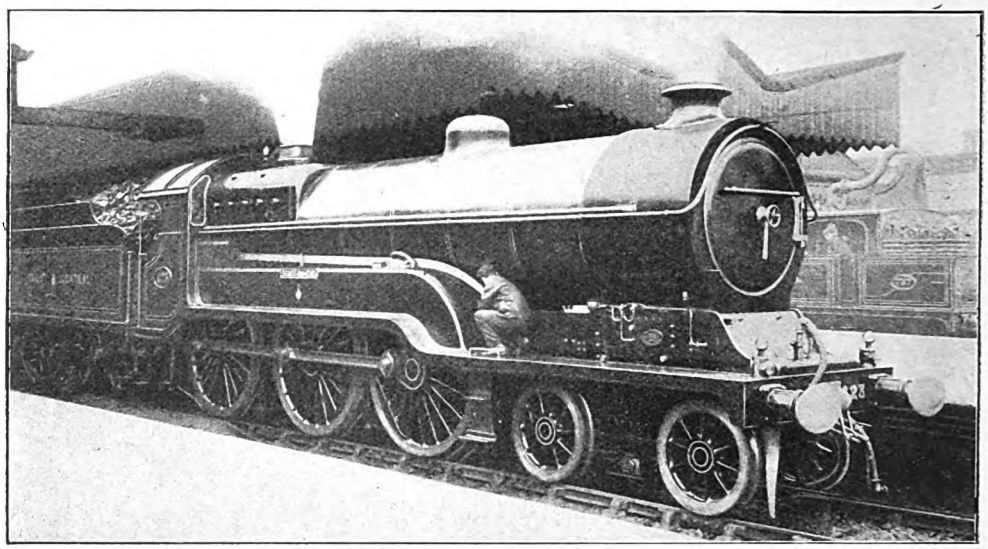

Photo] [*W. H. C. Kelland.*

GREAT CENTRAL RAILWAY.
No. 423, *Sir Sam Fay*, at Guide Bridge.

adhesion; in the case of the Georgia, Southern and Florida Railroad 4–6–0 the figures are 31,900 lbs. and 66 tons, or 480 lbs. per ton; the Aitchison, Topeka and Santa Fe Railroad 4–6–2 has 41,000 lbs. and 77 tons, or 530 lbs. per ton; while the Chicago, Burlington and Quincy Railroad 4–6–2 design has 42,500 lbs. and 76 tons, or 555 lbs. per ton. I except the Carolina, Clinchfield and Ohio Railroad 4–6–2, as this was built for service on exceptional grades, and is designed accordingly.

The proportion of tractive effort to adhesion weight, therefore, varies mainly from 480 to 555 lbs. per ton. Incidentally, one cannot help remarking on the enormous axle-loads permissible in America. A total of 54 tons on two axles works out at 27 tons per axle, while the adhesion weights of 76 to 79 tons in three cases give an average of nearly 26 tons, against our general maximum figure of 20 tons. The frequency of rail fractures in the States, and the accidents arising therefrom, may doubtless be attributed partly to this cause. Factors of safety in all branches of American design are cut to much finer limits than is the case over here, but I think it will be agreed that British practice in these respects is altogether more desirable.

Turning now to the British locomotive types specified in my friend's letter, and mentioned in the first paragraph, we find that one of them—the North British "Atlantic"—is more over-cylindered even than his New Orleans and North Eastern 4–6–2, in that the proportion of tractive effort to adhesion weight is 23,500 lbs. to 40 tons, or 590 lbs. per ton. But it could hardly be admitted that this type has distinguished itself over and above the other five mentioned. The Caledonian 4–6–0 *Cardean* has proved itself capable of the finest wôrk with heavy loads on difficult grades, and yet has a proportion of only 21,300 lbs. effort to 55·8 tons adhesion, or 385 lbs. per ton. Moderate cylinder dimensions are a feature of Caledonian practice, but they could not be held to have impaired in any degree the performance of the engines. The other four types—the Great Northern Railway and North Eastern Railway "Atlantics" and the Great Central Railway and London and South Western Railway 4–6–0's—occupy what might be considered an average position as regards this country in the matter of these dimensions. Great Northern "Atlantics" are noted for the abnormally small dimensions of their cylinders, their tractive effort being only 15,800 lbs., but the moderate adhesion weight of 36 tons leaves a figure of 435 lbs. per ton. The North Eastern 3-cylinder "Atlantics," again, are only moderately cylindered, their tractive effort being 17,600 lbs. and their adhesion weight 40 tons, or 440 lbs. per ton. But a proved ability on the part of the latter engines to haul all but 550 tons on a faintly rising grade at 61·6 miles per hour, or to haul a lighter load on a level track at nearly

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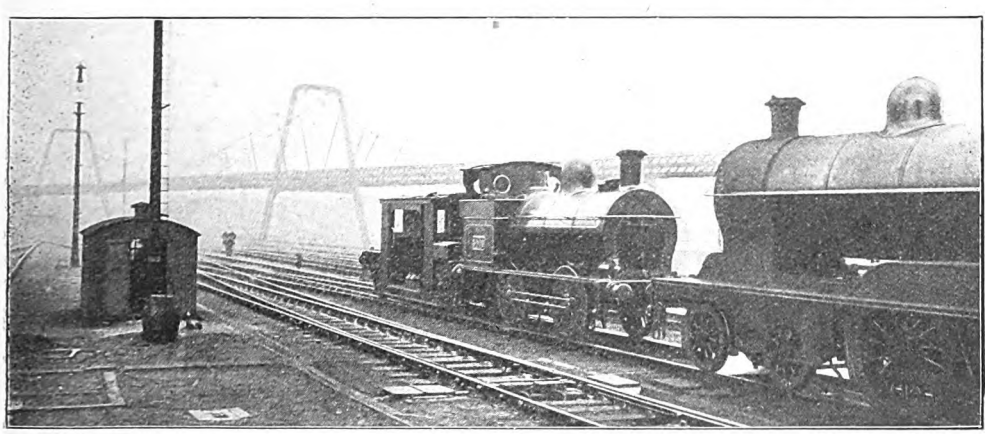
80 miles per hour, hardly indicates any deficiency in the matter of performance. The Great Central Railway and London and South Western Railway figures for the latest and largest Robinson and Urie 4–6–0 creations are 23,700 and 26,700 lbs. tractive effort, 56·5 and 58·6 tons adhesion weight, and 420 and 455 lbs. of effort per ton respectively. It may be taken, therefore, that from about 420 to 455 lbs. per ton represents the average figure for this country, as against the 480 to 555 lbs. of the American types cited.

I have not yet found the time to complete the final columns of the comparative dimensions and proportions of British superheater express engines, or I might have been able to deal with this question more fully. But I have been interested to refer back to the table of non-superheater engines which appeared in the March, 1911, issue and to see how these proportions worked out in that case. In those calculations the tractive effort was calculated at 75 per cent. of the nominal boiler pressure, and the foregoing calculations at 85 per cent. therefore necessitate a proportionate increase in the figures there given. With this alteration the average proportion of tractive effort to adhesion weight worked out in the case of 4–6–0 engines to 435 lbs. per ton, in that of 4–4–2 engines to 510 lbs. and of 4–4–0 engines to 505 lbs. per ton, while with the single engines the ratio was no less than 835 lbs. per ton. The most remarkable of the last-mentioned types in this respect were the large single bogie engines built by the Great Central Railway in 1900 for running their express services on the London Extension. These had 19½ in. by 26 in. cylinders, and 200 lbs. boiler pressure, giving no less than 18,000 lbs. tractive effort in conjunction with rather under 18½ tons adhesion! Similarly the Midland "Princess of Wales" class, with identical cylinders and 180 lbs. pressure, had an effort of 16,200 lbs. with 18½ tons adhesion. In these cases the total effort per ton of adhesion worked out at 980 lbs. and 875 lbs. respectively, but these engines would never have been capable of the work they performed were it not for the introduction of steam sanding, which has greatly modified the whole question of adhesion. Whatever "qualification" a locomotive type may have, however, for an increase in its cylinder dimensions, it does not by any means follow that the indiscriminate addition of inches to diameter and stroke are likely to revolutionize its performance. Experience in this country points rather in the opposite direction.

It is doubtless a great temptation to a locomotive designer who has evolved a successful design to increase the cylinder dimensions, in later "editions" of the type, with the idea of securing increased tractive power without correspondingly increased means of raising steam or increased weight, and consequent cost. But such alterations have but rarely proved successful. For instance, Stirling's earlier 8 ft. 1½ in. singles, with their large 18 in. by 28 in. cylinders, were a class of engine certainly cylindered up to the limit of their adhesion, but performed work which rendered them famous, the large wheel diameter counteracting the effect of



Photo] [*W. H. Whitworth.*

LONDON AND NORTH WESTERN RAILWAY.

0–4–0 works shunting engine, No. 3009, attached to works "cab," in siding outside Crewe station. The footbridge shown leads from the station into the works.

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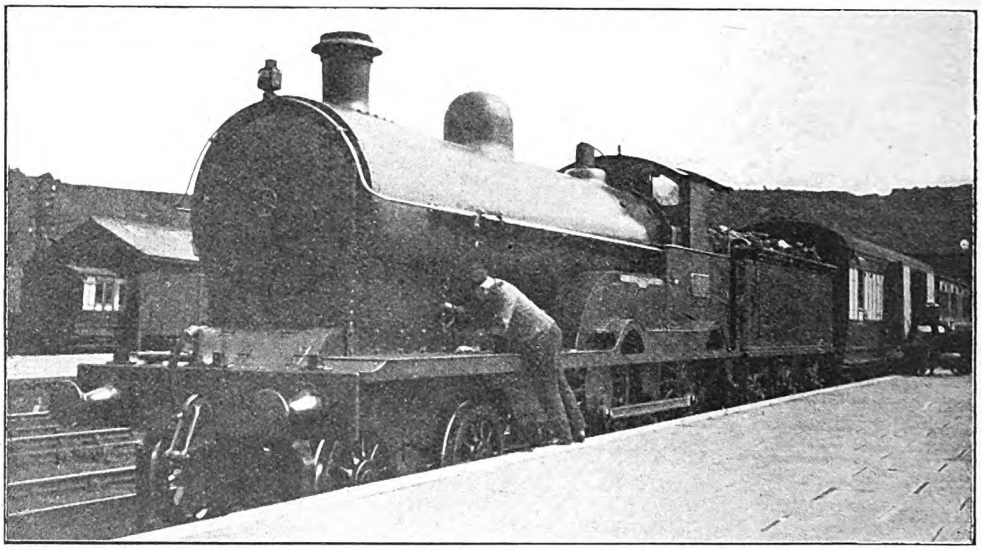
the long stroke. The last batch of these engines, however, in which the designer increased the cylinder dimensions to the colossal size of 19½ in. by 28 in.—an amplitude out of all proportion to their very moderate steam-raising capacity—were not nearly as efficient in their performance. Even at the present time there are in existence modern express locomotive types, which for obvious reasons cannot be specified, that seem decidedly over-cylindered, even the large boilers provided being apparently inadequate to fill them, especially on long adverse grades, and their performance is correspondingly poor. But there are other famous types that are equally noted for their under-cylindering, in relation to the adequacy of their steam supply, their work being similarly characteristic of their proportions. Of course, as the writer of the article quoted pointed out in connection with American practice, the addition of superheating apparatus alters the whole complexion of affairs The temperature of highly superheated steam is such that it may be allowed to expand in a greater ratio than saturated steam, with the result that condensation is minimised, and cylinders of larger cubic capacity may with propriety be fitted.

It is, therefore, desirable that engines of existing types fitted with superheaters, or new versions of old types to which superheaters have been added, should have cylinders of enhanced dimensions, and there are numbers of cases in which the diameter of cylinders, under these conditions, has been increased by 1 or even 1½ in. But I must really take leave to doubt whether some of the exceedingly drastic suggestions of my correspondent would serve to metamorphose the working and double the dividends of the lines to which he refers. For instance, on the Great Western Railway he is anxious to see the working of 4–6–0 engines terminate at Newton Abbot, engines of the 2–6–0 type being used west of this point with stopping trains, and with expresses a new 4–6–2 type having "21 in. by 28 in. cylinders, 5 ft. 8 in. driving wheels, 200 lbs. pressure, and an adhesion weight of 130,000 lbs.," or 58 tons. These dimensions, he claims, would afford a tractive effort of 30,000 lbs., and "if a grate area of 54 sq. ft. were used in conjunction with a standard boiler, work on Hemerdon bank would be revolutionized." Probably it would, but the idea of the Great Western Railway setting out to build a class of vast locomotives at £4,000 or £5,000 apiece in order to revolutionize the work on this section only of the main line, where daily express trains can be counted on the fingers, verges on the ludicrous. Similarly, his desire



Photo] [*D. B. Bradshaw.*

LONDON AND NORTH WESTERN RAILWAY.
Holyhead train in Bangor station.
4-4-0 superheater engine, No. 1631, *Racehorse.*

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to "give the North Eastern 'Atlantics' about 45 to 50 sq. ft. of grate area, and the work north of Newcastle would be much better" is hardly convincing. Still less so is the claim that, similarly modified, the North British "Atlantics" would be "better off as well, but I think the addition of a superheater, and conversion to 4–6–0–'s with 22 in. by 28 in. cylinders would be wiser."

It is well to remember, when comparing American locomotive practice with British, that the conditions of service are entirely different. In this country, as has been pointed out previously in these columns, express train services are arranged on a basis of frequency, owing to the greater density of circulation of the population, with the result that main line loads are more or less moderate. Trains which here follow one another in rapid succession over the same main line, with very few intermediate stoppages, would be combined on the Continent or in America into one train serving several destinations. If we add to this the greatly enhanced weight of American rolling stock, much of which is of all-steel construction, and includes on the crack trains a large proportion of Pullman vehicles, weighing far more per passenger conveyed than our own rolling stock, we shall readily understand that the 450-ton trains over here which cause us to gasp at their immensity would cause no surprise to the visitor from a land where 800 and 900-ton expresses are by no means uncommon. With such vast trains and frequent stoppages, therefore, the enormous locomotives employed in the States become an economically sound proposition, and such steam-raising capacity and cylinder proportions are necessary in order to secure reasonably rapid acceleration from rest and intermediate speeds. Such engines to work our train services as at present constituted would probably not prove an economically sound proposition, and here we come to the very basis of locomotive design. Broadly speaking, the aim of the locomotive department is to produce engines that will furnish a return in their performance on their costs, both of construction, working and maintenance. Thus the locomotives of every railway are designed in such a way as best to meet the requirements of the line on which they run, and although the whims of designers have sometimes been allowed too free a rein, with resultant inefficiency and even failure, the principal basis on which designs must be judged is as to whether they "pay" or not. So far as these islands are concerned, I think this question admits without difficulty of an affirmative answer, and, although the untoward circumstances of the present, with shortage of fuel, excessive loads and other difficulties, might sometimes seem to indicate an inability of even our modern engines to cope with the temporary conditions, there is probably no real call yet for the vast increments of power which my correspondent desires to see introduced.

The mention of the 2–6–0, or "Mogul," engines of the Great Western Railway in the last paragraph but one reminds me that once, long ago, I gave a promise to describe a run behind one of them, which has not yet been fulfilled. For the details of this I am indebted to the kindness of a young friend who appears to have specialised in the timing of half-day excursions, of which he sends quite an extensive collection of carefully compiled details. They serve as a melancholy reminder of those positive feasts of travel at a minimum of cost that must have delighted the heart of many a railway enthusiast, and of which the War has deprived us—possibly, indeed probably, for good and all. The particular train on which No. 4353 displayed her prowess was the Weymouth half-day trip on Easter Monday of 1914, loaded up handsomely to 13 bogie vehicles (partly 70 ft. stock), with restaurant car, and weighing empty 391½ tons. Even though the train were packed, I fear we cannot accept the ultra-generous estimate of 43½ tons for passengers, as at an average calculation of 20 to the ton this would mean a total of nearly 900; 425 tons is probably nearer the mark.

In its initial stages the running of the 2–6–0 engine, with its 5 ft. 8 in. wheels, furnishes a most interesting comparison to the work of its larger 6 ft. 8 in. brethren, of the 4–6–0 type, detailed in the last issue. A slack over the widening works at Westbourne Park hampered the start, but even then Southall, 9 miles out, was passed in 13 min. 44 sec.; Slough, 18½ miles, in 22 min. 54 sec.; and Reading, 36 miles, in 40 min. 54 sec. The work of this small-wheeled engine on the level was thus exceedingly good, the time of 21 min. 32 sec. for the 22 miles from Southall to Twyford, indeed, being quite remarkable. A speed of 69 miles per hour was recorded by the observer at Slough, but as this was with an ordinary watch, it is open to question whether so high a rate was actually touched; although the

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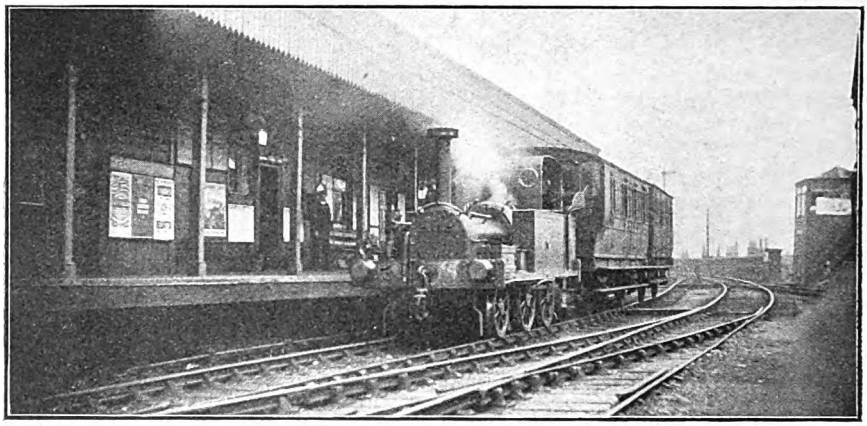

Photo] [*K. A. C. R. Nunn.*

MILLWALL EXTENSION RAILWAY.

3.53 p.m. *ex*-Millwall Junction at North Greenwich, 2–4–0 engine No. 6.

time of exactly 7½ min. for the 8 miles from Langley to Maidenhead certainly indicates an average speed of 64 miles per hour. The usual careful slack at Reading was succeeded by a further check to 20 miles per hour at Reading West, so that the 5¼ miles from Reading to Theale took 7¼ min. But from there the work on the rising grades to Savernake was very fine, the 11¾ miles from Theale to Newbury taking 13¼ min., the 8½ miles thence to Hungerford 9½ min., and the final 8¾ miles to Savernake summit 9 min. 54 sec. That is to say, the 29 miles from Theale to Savernake, entirely rising, were reeled off at an average speed of all but 53 miles per hour, and the initial 70¼ miles from London were covered in 80 min. 48 sec., or about 79 min. net. This is really but little inferior to the work of the 4–6–0 engines, as the load was very heavy, and is the more remarkable when it is remembered that the train concerned was a half-day excursion. The lowest speed on the final 1 in 144 to the summit was 45 miles per hour.

Very moderate speeds were run on the descent from Savernake to Westbury; considerable distances must have been covered under very easy steam, or without it altogether, as the 11 miles from Savernake to Patney took 12 min., and the 14¼ miles thence to Westbury 15 min. 6 sec. Thus Westbury, 95½ miles from London, was passed in 107 min. 54 sec., but the smart running out to Reading clearly shows that, allowing for the two slacks, and, say, for an average rate of 65 miles per hour from Savernake to Westbury, the possible time from London could have been rather under 103 min. Clearly, however, the train was well before time, and there was no occasion for hurry. After slacking at Westbury, the ensuing 5¾ miles to Frome took 8¾ min., but the Frome slack was succeeded by a dead stand for signals about ½-mile beyond the station. Consequently the 5¼ miles from Frome to Witham took 14 min. 53 sec., and the 5½ miles from there over to Bruton 7 min. 42 sec. With smart running on the easy grades beyond, however, the ensuing 15 miles to Yeovil stop were completed in exactly 17 min., the 127¼ miles from London having been covered in 156 min. 14 sec. In view of the delays and the moderate downhill running, it is quite evident that the engine was being run well within her powers, and that the gain of 1¾ min. on schedule time might without difficulty have been increased by as much as 10 min. if necessary. A total of 9 min. 40 sec. was spent at Yeovil, the train having to draw up twice, and a 0–6–0 tank engine was taken thence as pilot to Evershot summit—a somewhat necessary measure with a 425-ton train, seeing that the penultimate 1½ miles of the climb are at 1 in 70–75, and the final 1½ miles at 1 in 51½! Unfortunately, my correspondent omits to give any details of the stop at the summit to detach the pilot, and it is not possible, therefore, to pass any judgment on the ascent. Inclusive of 2½ min. standing at Evershot, the 20½ miles from Yeovil to Dorchester occupied 35 min., and then, after a stop of 4 min. at the latter town, the final 7 miles into Weymouth were covered in 11 min. 10 sec., start-to-stop. With all delays and the extra time spent in drawing up twice at Yeovil and Dorchester, the arrival at Weymouth was only 3 min. late—a result

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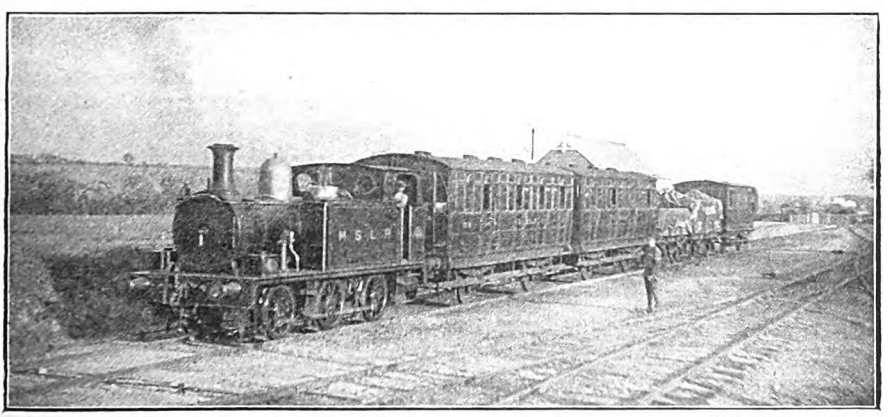
which reflects very great credit on driver and engine.

In the reverse direction the work was also so good as to merit notice, the train engine being this time a 4–4–0 No. 3803, *County Cork*, piloted by an inside cylinder 4–4–0 of the "Bulldog" class, No. 3354, *Restormel*. The load, needless to say, remained unchanged. There is anything but a good start from Weymouth, 2 out of the initial 4 miles' climb being inclined at 1 in 48–54, but Dorchester, 7 miles, was reached in 15 min. 40 sec. After this the almost continuous ascent to Evershot was tackled quite brilliantly, even though it includes one 3-mile stretch at 1 in 111-141 past Grimston, and concludes with another 2½ miles at 1 in 69-162; the 11¾ miles from Dorchester to Evershot took 17 min. exactly, and, with very cautious running from the summit onwards, the 20½ miles from Dorchester to Yeovil occupied 28½ min., start-to-stop. Seven minutes were spent at Yeovil, and, from the fresh start, Castle Cary, 11¾ miles, was passed in 14½ min. and Witham, 20¾ miles, in 25 min., 54 sec., no details being given of the intervening climb to "mile-post 122¾" summit. Frome, 26 miles, was passed in 31 min. 10 sec., and Westbury, 31¾ miles, in exactly 40 min., the severe service slacks at these two points causing the 15 miles from Witham to Edington to take 20 min. But the 10¼ miles from Edington to Patney, including 6 up at 1 in 222, occupied only 11 min. 36 sec., and the last 11 miles to Savernake, where a stop was made to detach the pilot, were run in the remarkable time of 11½ min. The last 3 miles of the latter distance are adversely inclined at 1 in 240–153. So the 57 miles from Yeovil to Savernake, including both Frome and Westbury slacks, had been covered in 69 min. start-to-stop. On the falling grades from Savernake *County Cork* soon got into her "stride," passing Hungerford, 8¾ miles, in 10 min., Newbury, 17¼ miles, in 17½ min.; and Theale, 29 miles, in 28 min., 36 sec.; the intermediate 19¾ miles from Bedwyn to Midgham occupied only 17½ min. But a bad check before Reading West, and a stop of 3 min. before Reading caused the 10¼ miles from Theale to Twyford to take 20 min., 44 sec. From Twyford excellent work was done on the level with this tremendous train, the 12½ miles to Slough taking 12 min. 20 sec., and the 14¼ miles on to Acton 14 min. 40 sec. Inclusive of the serious delay at Reading, therefore, the 66 miles from Savernake to Acton had only taken 76 min. 20 sec., and Paddington should have been reached at least 8 min. early, but as it was prolonged stoppages in the last 4 miles made the arrival 19 min. late. Still, the net time for the 70¼ miles from Savernake to London was certainly not more than 75 min. Sumptuous fare, this, for the half-day excursionist!

A run on the Weston-super-Mare half-day excursion was productive of some equally fine results. In this case the engine was a 4-cylinder 4–6–0, No. 4017, which at that time bore the objectionable title of *Knight of the Black Eagle*—an appellation which has since been abandoned in favour of *Knight of Liège*. The load in this case was lighter, consisting of 10 eight-wheelers of various sorts (the majority 70 ft. stock),



Photo] [*K. A. C. R. Nunn*

MID-SUFFOLK LIGHT RAILWAY.
5.52 p.m. Haughley–Laxfield mixed train leaving Haughley.
0–6–0 engine No. 2.

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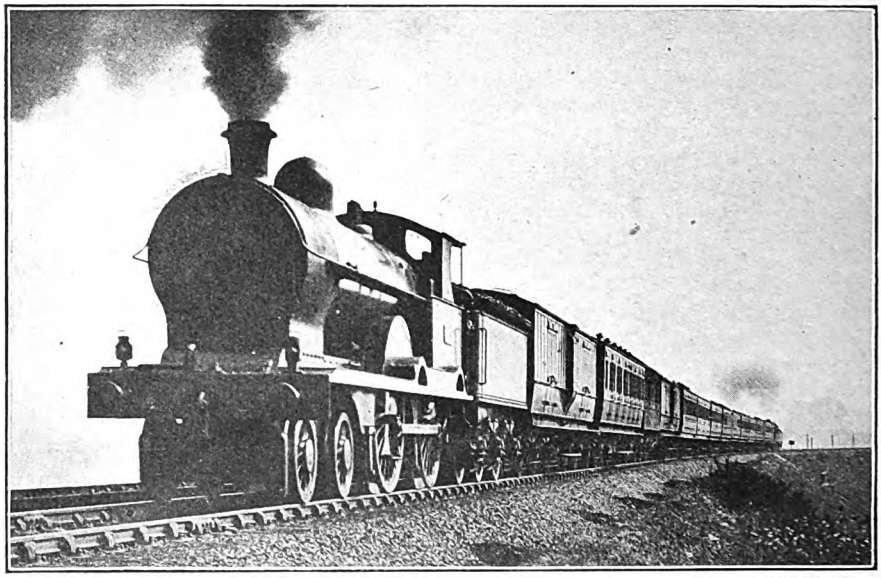
weighing 305 tons empty, and 320 tons with passengers. In its earliest stage the run was greatly delayed by reason of a prolonged permanent way check as far as Old Oak, and in consequence 16 min. 29 sec. were required to pass Southall, 9 miles. But the work that followed was fully up to the level of that performed on the 2-hour Bristol expresses. The 9½ miles from Southall to Slough were covered in 9 min. 21 sec.; the 17½ miles from Slough to Reading in 15 min. 20 sec.; the 17 miles from Reading to Didcot in 15 min. 50 sec.; and the 24¼ miles from Didcot to Swindon in 23 min. 10 sec. So Swindon, 77¼ miles from town, was passed in 80 min. 10 sec. gross, and certainly not more than 76 min. net, the 58¼ miles from West Drayton to Shrivenham having occupied only 53 min. 21 sec. The remainder of the journey was badly delayed by reason of a dead stand for nearly 2 min. between Swindon and Wootton Bassett, which caused the 5¾ miles between these two points to take 11 min., repairs in Sodbury Tunnel which necessitated 9½ min. for the 4½ miles between Badminton and Sodbury, and a signal check at Filton, the last 6¼ miles from Winterbourne into Stapleton Road taking 9 min. 23 sec. The unchecked 17 miles from Wootton Bassett (passed very slowly) to Badminton took 19 min. 20 sec., while the 5¼ miles from Sodbury to Winterbourne occupied 5 min. 22 sec. Assuming, on the basis of the work performed on unchecked sections of the journey, that 4 min. were lost by the Westbourne Park slack, 5 by the stop beyond Swindon, 4½ by the Sodbury Tunnel delay, and 1¼ by signals at Filton, the gross time of 134¾ min. for the 116 miles from London to Stapleton Road is reduced to a net one of exactly 2 hours. As the booked time was 130 min., the total loss, despite all these delays, was only 4¾ min. The continuation of the run to Weston, with various slacks and delays, calls for no comment while the much more ample allowance on the up journey divests it of all interest.



Photo] [*F. E. Mackay.*

LONDON AND NORTH WESTERN RAILWAY.

Newspaper express ascending the Shap incline, with banking assistance. 4-4-0 locomotive, *Tamerlane.*

Before leaving the Great Western Railway, I may as well complete the collection of half-day trips by a description of one which I made a year or two ago to Malvern. As this run has been mentioned previously, brief details will suffice. The load was practically identical with that of the Weymouth trip—13 eight-wheelers of mixed corridor stock including restaurant car—and with a very full load of passengers weighed 420 tons; the engine was an inside cylinder 4-4-0, No. 3718, *City of Winchester*, which, although not putting up such good work as the larger and more

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powerful "Mogul," certainly acquitted itself creditably. After stopping at Westbourne Park, Southall, 7¾ miles, was passed in 12 min. 40 sec.; Slough, 17¼ miles, in 22 min. 40 sec.; Reading, 34¾ miles, in 41 min. 50 sec.; Didcot, 51¾ miles, in 59 min. 55 sec., and Oxford, 62 miles, was reached in 72 min. 20 sec. A maximum rate of 62·5 miles per hour was reached at Slough and Radley, while the speed was eased to 45 through Didcot. Beyond Oxford very fair work was done on the easily graded, but faintly rising grades to Moreton-in-Marsh, where a signal check was encountered; Charlbury, 13¼ miles, was passed in 20¼ min.; Kingham, 21¼ miles, in 29 min. 50 sec.; Moreton, 28¼ miles, in 38¾ min., and Honeybourne, 38¼ miles, was reached in 51 min. 5 sec. Just before Honeybourne a speed of 64 miles per hour was touched, but owing to the length of the train the stop was made very slowly. From this point the ensuing 5¼ miles to Evesham were covered very smartly in 7 min. 50 sec., start-to-stop. The conclusion of the run suffered somewhat from checks, and the return journey, save for a smart initial time of 17 min. 50 sec. for the 13½ miles from Worcester to Evesham, with a top speed of 67 miles per hour at Pershore, fared similarly. These are not brilliant times, of course, but at the same time they are quite a creditable showing for a 4–4–0 of moderate dimensions so heavily loaded.

My correspondent's next experiment was on a half-day excursion to Bournemouth, run by the London and South Western Railway, and gained added interest in that the engine was the one and only large-boilered 4-cylinder 4–2–2–0, No. 720. The load was quite a substantial one, according to London and South Western standards, consisting as it did of 12 eight-wheelers, weighing 280 tons empty and 300 tons full. Clapham Junction, where a stop was made to pick up passengers, was reached in 9 min. 4 sec. (4 miles). Re-starting, Surbiton, 8 miles, was passed in 13¼ min; Woking, 20½ miles, in 27 min. 14 sec.; Farnborough, 29¼ miles, in 39 min. 9 sec.; and Basingstoke, 44 miles, in 56 min. 35 sec., equivalent to a passing time from Waterloo of about 61½ min. The lowest speed at Pirbright, after 10½ miles mostly adverse at 1 in 296–326, appears to have been about 43 miles per hour. No time was recorded at Litchfield summit, but the speed here must have been very low, as the 10¼ miles from Basingstoke to Micheldever occupied no less than 14 min. 50 sec.; the succeeding 17¾ miles to Swaythling, however, were covered smartly in 15 min. 56 sec., with a maximum of 72·5 at Shawford. So Winchester was passed in 79 min. 14 sec. from Clapham Junction (62¾ miles); Eastleigh in 85¼ min. (69¾ miles); and Southampton West, 75½ miles, in 92 min. 9 sec., after a careful slack over Northam curve. These again are not remarkable times, but, allowing an estimated addition of 5 min. for a start from Waterloo instead of Clapham, it will be seen that they correspond fairly closely to those of such trains as the 10.15 a.m., 12.30 p.m. and 4.50 p.m. from Waterloo, and with a substantial load; further the arrival was 4 min. early. On leaving Southampton, Totton, 3¼ miles, was passed in 6¼ min.; Brockenhurst, 13½ miles, in 19 min.; Christchurch, 25 miles, in 33 min., and Bournemouth Central, 28½ miles, was reached in 38½ min., 5½ min. early. Once again the return journey fell rather short of the achievements of the outward trip, owing to delays and an increased time allowance.

On the Great Northern Railway, a superheater "Atlantic," No. 1460, had an easy task to keep time on the Skegness half-day excursion, with a load of only ten 8-wheelers, or 280 tons in all. Finsbury Park, 2½ miles out, was passed in 6 min., and New Barnet, 9 miles, in 14 min., but after that two severe signal checks were experienced in the neighbourhood of Potters Bar, so that 28 min. were taken to Hatfield, 17¾ miles, and 37 min. 10 sec. to Knebworth, 25 miles. The remainder of the journey was run under easy steam, as may have been necessary apart from the easy booking, as there is no opportunity of getting water until Spalding, 93 miles from London. So the 7 miles from Knebworth to Hitchin were covered in 7 min. 50 sec.; the 12 miles from Hitchin to Sandy in 11½ min.; the 14¾ miles from Sandy to Huntingdon in 16 min. 20 sec.; and the 17½ miles from Huntingdon to Peterborough in 19 min., making a total of 90 min. 50 sec. from town, or about 87 min. net. After the usual slack at Peterborough, the remaining 16¾ miles to Spalding were run in 22 min. 10 sec., the total time for the 93 miles from London being 113 min., or about 109 min. net. After stopping 8½ min. at Spalding for water and examination, the 14¼ miles to Boston, passed at reduced speed, were covered in 17½ min., and the 24¼ miles thence to Skegness, with very easy running and a slack at Wainfleet, in

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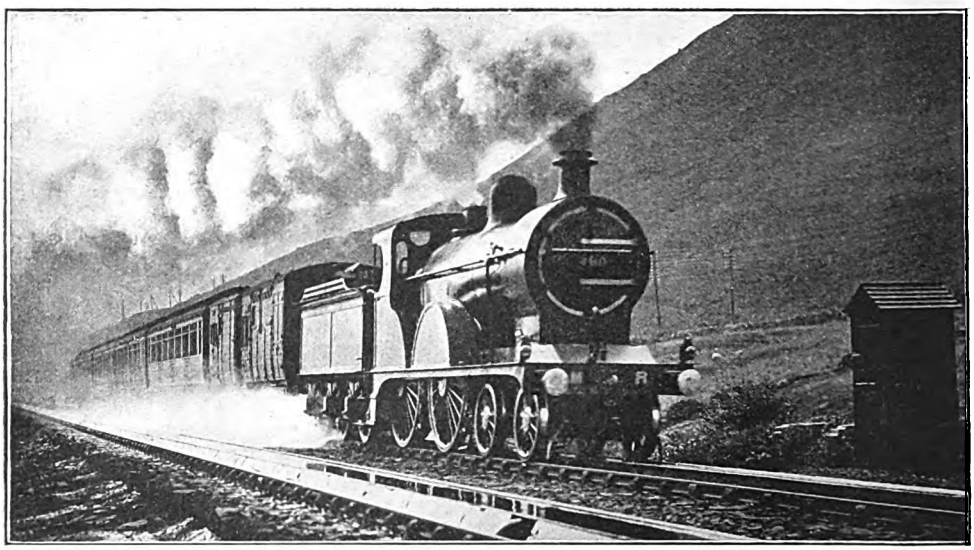
32 min., the arrival being a modest 9 min. in advance of time. It should be noted here, however, that the schedules of these trains have been framed with a view to much heavier loads than were carried on this occasion. Coming up, with the same engine and load, the 38½ miles from Skegness to Spalding, with the slacks at Wainfleet and Boston, occupied 51 min. 35 sec., and the 90½ miles from there to Finsbury Park were covered, at very moderate speed, in 108½ min., despite a dead stand for signals at Welwyn, with the result that the train was no less than 11½ min. early on arrival! Our young friend has very carefully worked out all the intermediate speeds, but I must be pardoned for doubting whether the rate from New Barnet to Oakleigh Park was 81·81 miles per hour, when from Hadley Wood to New Barnet it was 59·21 and from Oakleigh Park to New Southgate 54·31! Timing in seconds against the quarter miles of Bradshaw not infrequently yields these somewhat startling results.

Not long before the War I found it convenient on one occasion to travel by the down Restall Tuesday excursion train from Marylebone, and had an interesting if, perhaps, a slightly disappointing journey. But the work performed was of necessity on a higher plane than that just described, as the booking demands it. The load consisted of four of the large open saloons, weighing 34½ tons each, two composite brake vehicles of the new standard 60 ft. stock, weighing 34 tons, and a kitchen car—231 tons empty and 245 tons full—and the engine was a large superheater 4-4-0, No. 435, *Walter Burgh Gair*. Unfortunately I have lost the notebook in which the run was recorded, and have only left the bare details, culled from a letter sent to a friend about that time. The 5·1 miles out to Neasden Junction occupied 10 min. 25 sec., and the 11·6 miles to Northolt (this train, of course, travels *viâ* Wycombe), in 18¾ min.; from Northolt the 11·4 miles up to Beaconsfield were covered in 14 min. 40 sec., and Wycombe, 27·9 miles out, was passed slowly in 38 min. 40 sec. from the start. From there to Woodford quite the best work of the journey was performed, as the load, according to Great Central standards, was decidedly on the heavy side. Despite the recovery from Wycombe slack up ½-mile at 1 in 141, and a further 5¼ mainly at 1 in 164, the ensuing 8·1 miles to Princes Risborough were covered in 10¼ min., while the 15·3 miles thence to Grendon Underwood Junction occupied 14 min. 10 sec., with a maximum speed of 71·4 miles per hour at Haddenham. To cover the



Photo] [*F. E. Mackay.*

MIDLAND RAILWAY.

Lake District express train running over the London and North Western Railway near Tebay. 4-4-0 engine No. 360.

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12·5 miles from Grendon to Brackley in 13 min. 20 sec., and the 9·8 miles from Brackley to Woodford in 10¾ min., were further excellent achievements, seeing that the first mentioned stretch includes 6½ adverse miles at 1 in 176, and the second 4¼ miles at the same inclination. Woodford, therefore, was passed in 87 min. 10 sec. from town, and with only 73·6 miles of the journey covered, some good speed was needed over the remaining 34 miles to Leicester, in order to complete the journey in 2 hours. In its concluding stages, however, the running was very disappointing, the highest speed on the long 1 in 176 descent to Braunston being only 64·3 miles per hour, and again on the similarly inclined descent past Whetstone 69·2 miles per hour. So the 14·1 miles from Woodford to Rugby took 14½ min., the 6·8 miles thence to Lutterworth 7¼ min., and the final 13·1 miles into Leicester 13 min. 5 sec., the arrival being exactly 2 min. behind schedule. But time could have been kept easily had the downhill running been up to the usual standard. The best time of the journey was that of 48½ min. from Wycombe to Woodford, 45·7 miles, ½-min. within the start-to-stop time of the 10.0 a.m. *ex*-Marylebone.

A sample of what the Great Central can do with excursion trains, however, is provided in the run sent by a correspondent which I quoted in these columns some short time ago in the opposite direction, and which is worth mentioning again in this connection. The engine was No. 430, also of the "Director" 4–4–0 class, and the load seven 8-wheelers, or 185 tons. At the start the train was delayed by the late running of the Newcastle-Barry express, and so left Rugby 17½ min. late, but from there to London the running was truly "fierce." Immediately after the start speed was reduced for permanent way operations, but Braunston, 4·7 miles, was passed in 6 min. 10 sec., and Woodford, 14·1 miles, in 16 min. 41 sec., despite the intervening rise of 6½ miles at 1 in 176. The subsequent 9·9 undulating miles to Brackley occupied 8 min. 34 sec., and some tremendous speed was then run on the falling grades to Grendon, including an undoubted maximum of 90 miles per hour, the 12·4 miles between Brackley and Grendon occupying only 9 min. 40 sec. Consequently the first 36·4 miles from the start had been covered in 34 min. 55 sec., or well inside "even time," and over 5 min. inside booked time. But still there was no slackening of effort. After reducing speed carefully over Grendon Junction, the ensuing 15·3 miles to Princes Risborough, including 5 adverse at 1 in 176-200, were covered in 14 min. 10 sec., and the 8·1 miles thence to Wycombe in 8¾ min. The remainder of the journey was somewhat spoiled by a bad signal check at Denham, the usual slacks at Northolt and Neasden, and cautious running into Marylebone, the final 27·9 miles from Wycombe taking 34 min., but even then the total time from Rugby, 87·8 miles, was the phenomenal one of 91 min. 50 sec., and the arrears of time had been reduced on arrival from 17½ min. to 4 min. 20 sec. With a clear road, there is quite a probability that all the delay might have been wiped off, and the run made in "even time" throughout, despite the observance of the usual service slacks at Grendon, Wycombe, Northolt and Neasden. This was indeed "some" running, and the more astonishing in that the express concerned was a cheap excursion train.

I had somewhere the details of quite a good run on the Midland half-day trip to Matlock—one of the most tightly-timed of all the afternoon excursions—but unfortunately I have mislaid them. So I will conclude with the description of a run on the weekly Great Eastern run to Clacton, which afforded some quite excellent running. The load in this case was one of twenty 6-wheelers, well filled with passengers, and weighing fully 350 tons in all. A most unusual combination of engines was provided in the shape of a 5 ft. 8 in. 2–4–0 mixed traffic engine, piloted by a 7 ft. 4–4–0 rebuild, Nos. 498 and 756 respectively. Stops were made at Stratford and Ilford, and an excellent start was made from the latter place, a speed of 52·5 miles per hour being attained by the time Romford was passed. This initial length of 5·1 miles took 7 min. 55 sec., and after a minimum speed of 28 miles per hour on Brentwood Bank, Shenfield, 12·9 miles, was passed in 19 min. 10 sec. Good work was done from Shenfield onwards, the ensuing 9·7 miles to Chelmsford taking 10 min. 25 sec.; the 8·9 miles on to Witham, where a severe slack was experienced, 10¼ min.; and the 13·1 miles from Witham to Colchester 14 min. 25 sec. Top speeds were 62·5 miles per hour beyond Ingatestone, and 70·3 approaching Colchester. Again on the branch some very fine times were made, as despite the usual slacks at Colchester and Wivenhoe,

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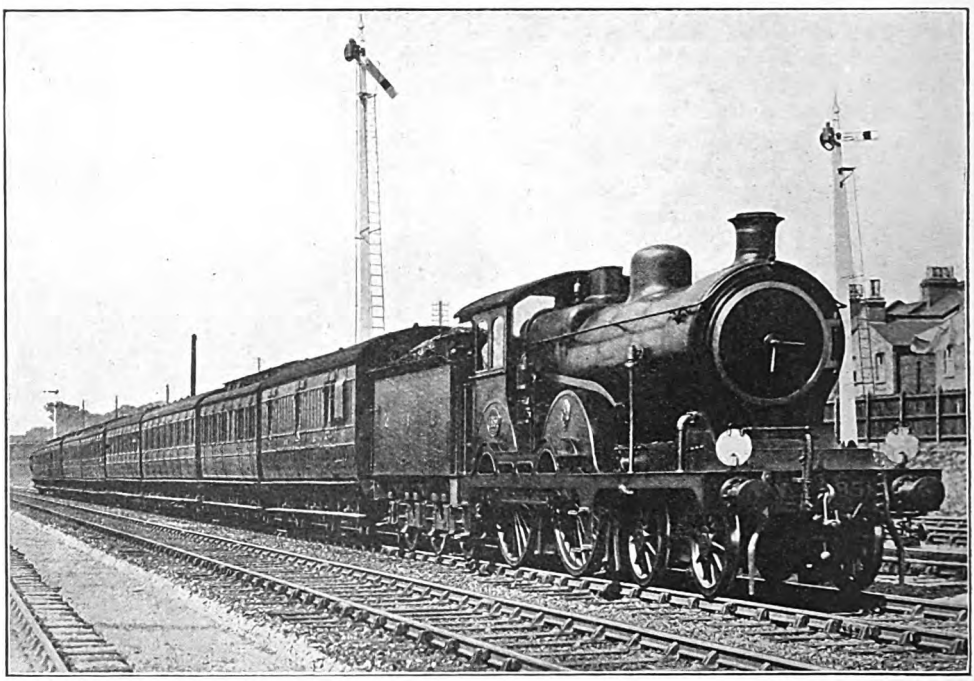
and a severe permanent check beyond Weeley, the 13·5 miles from Colchester to Thorpe only took 17 min. 50 sec. So the 59 miles from Ilford to Thorpe had been covered in 72¼ min., or 69 min. net, allowing for the signal check and the permanent way caution, against 75 min. allowed. But the most surprising feature of the run was that the net time of 64 min. from Chadwell Heath to Thorpe was no less than 3 min. under the time allowed the crack 5.30 p.m. Clacton and Walton express from Liverpool Street, or 5 min. under the modified time in the latest time-table. There is reason for comment in the remarkable extent to which the excursion business was developed in this country prior to the War—far more so than in any other country in the world—but there is cause for positive astonishment when the cheapest excursions of all give even the regular expresses points and a beating!



Photo] [*F. E. Mackay.*

GREAT EASTERN RAILWAY.
Yarmouth express drawn by Belpaire 4-4-0 engine No. 1851.

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The Great Western Railway in South Wales.

[No. III.]

By DENIS O'DONOGHUE.

(*Continued from page* 214, *March number.*)

A STRAIGHT track of 13 miles from Carmarthen brings the railway to Whitland, the junction for the Cardigan and the Tenby and Pembroke lines. These branches are both single lines, and on the Cardigan branch there is no Sunday service. On the Cardigan Branch 4 trains run to and fro between Whitland and Cardigan, a distance of 27½ miles, 2 trains each way being mixed trains *i.e.*, trains composed of passenger and goods vehicles operating under special Board of Trade regulations. The trains from Whitland supply services to Cardigan in connection with the London expresses and 3 of the trains from Cardigan make connections for London at Whitland.

On the route to Tenby and Pembroke Dock, which is a busier line all round than the Cardigan Branch, 5 services operate on week-days between Whitland and Pembroke Dock, augmented by a couple of additional trains between the county town and Pembroke Dock and between Tenby and Pembroke Dock. On Sundays a train runs each way between Tenby and Pembroke Dock. Four connections are given to Tenby and Pembroke Dock off the express trains from London and *vice versa*; a through carriage for Tenby and Pembroke Dock is attached to the mid-day South Wales express from London.

From Whitland to Pembroke the railway passes through the country historically known as "Little England beyond Wales." In the year 1108 part of Flanders was submerged by the sea, and the refugees who came to England were settled by Henry I. in various parts of Wales. Some settled around Swansea, but the majority went to Pembrokeshire where they occupied the south-eastern part, the most fertile. To this day the difference can be observed between the people of that district, the descendents of Flemings, and the Welsh in physical attributes, customs and speech.

Clynderwen, the next station west of Whitland, is the junction for the North Pembrokeshire and Fishguard line. From Clynderwen to Fishguard, *viâ* Rosebush, the line is single for 19 miles to Letterston Junction where the principal line for the Fishguard traffic from Clarberton Road joins it; thence to Fishguard Harbour, a distance of 5 miles, the track has been doubled except for a length of 1½ miles between Manorowen and Fishguard and Goodwick. On the North Pembrokeshire and Fishguard line the gradients are sharp and a general speed restriction of 25 miles per hour is observed between Clynderwen and Letterston Junction, reduced to 10 miles per hour at certain points; the maximum speed is 10 miles an hour between Letterston Junction and Fishguard and Goodwick. The steepest gradient on the Great Western system over which passenger trains run is on this branch, 1 in 27. The track from Clynderwen is mostly on a rising gradient but falls from Letterston Junction to Fishguard and Goodwick, the descent approaching Fishguard and Goodwick station being acute, 1 in 50. Over this line work three passenger trains a day on week-days between Clynderwen and Fishguard, two from Clynderwen and one from Fishguard as "mixed" trains.

At Clarbeston Road, 6½ miles west of Clynderwen, is the starting point of the railway constructed by the Great Western Company to Letterston 11 miles, to join the North Pembrokeshire and Fishguard line to Fishguard, and opened in 1906, the year of the inauguration of the Fishguard-Rosslare route to Ireland. The North Pembrokeshire and Fishguard line was quite unsuitable for the passage of heavy corridor boat trains, and a double track was laid

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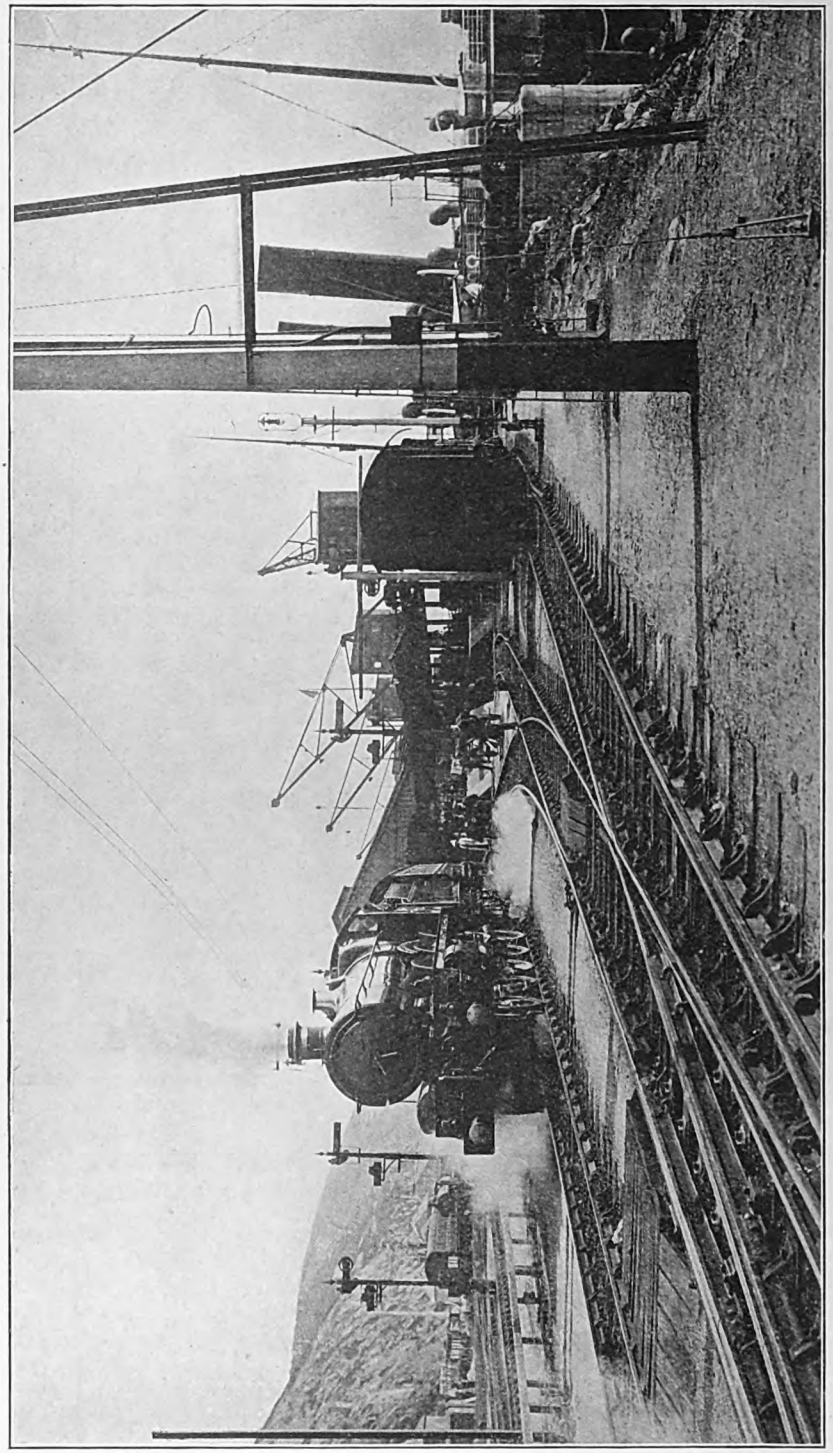

Photo] [G.W.R.

BOAT EXPRESS TRAIN AT FISHGUARD, DRAWN BY FOUR-CYLINDER 4-6-0 ENGINE.

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down from Clarbeston Road to Letterston Junction, 2 miles north of Letterston station on the north Pembrokeshire and Fishguard Railway. For a mile this line was laid on partially formed banks and in cuttings that were commenced by Brunel about 1845 and abandoned in 1851 when the decision was come to to make Milford the terminus instead of Fishguard. The derelict work included a bridge partially built over a road and now finished. The work involved in the construction of the line included the spanning of the river six times, the diversion of the river six times, and a short diversion of the main Haverfordwest-Fishguard road. The hardest task was the excavation of very hard rock at the cutting commencing at the place where the Haverfordwest-Fishguard road was diverted. It consisted mainly of quartz containing gold, but not in sufficient quantity to pay for extracting, and the drilling by steam and air drills was a very slow process that went on day and night for four months. The line is a good one with the ruling gradient 1 in 108 and the sharpest curve 30 chains radius

The local passenger service between Clarbeston Road and Fishguard is provided by motor cars working between the terminal points of Whitland, Neyland and Fishguard, as well as by trains connecting the two stations and working east of Clarbeston Road. There are also motor cars working between Fishguard and Goodwick and the Harbour station. In all, passengers from Clarbeston Road have five services to Fishguard and three back. There is no local service on the line on Sundays.

At Clarbeston Road the line to Neyland and Milford Haven bends south, the single line branch to Milford Haven leaving the main line at Johnston. Ten trains run each way between Johnston and Milford Haven, 12 on Tuesdays and Thursdays, and 13 on Saturdays; the branch is closed on Sundays. In the days of the sailing of the Irish boats from Milford Haven to Waterford and Cork, before the change to Fishguard, Neyland station, then known as New Milford, to distinguish it from Old Milford, as Milford Haven station was then called, was the embarkation station. The station is now known by the name of the parish in which it is situated. A steam ferry connects Neyland with Pembroke on the opposite shore of the Haven.

If the lines of the Great Western Railway through West Monmouthshire and Glamorganshire lie almost completely in a busy, industrial country, cheerless for the traveller by train, the country served west of Swansea will more than compensate for any depression evoked by the sight of the landmarks which are the indispensable appurtenances of coal-fields and iron-works. Swansea itself, although it is one of the great industrial and commercial centres of the country, is in many respects a desirable town. It is cheerful, bright and up-to-date, and a convenient centre for visiting the Vale of Neath and the Gower Peninsula. The immense stretch of sands at Swansea is classed among the finest in Great Britain.

The railway from Llanelly to Llandilo and Llandovery, on the Vale of Towy section, gives access to beautiful country. It bridges the river Towy at Llandilo, and all the way to Llandovery keeps close company therewith. Llandilo and Llangadock are good angling centres, and Llandovery is, perhaps, the best resort in the Vale of Towy to make a resting place. The town, the corrupted name of which signifies "the church amongst the waters," is pleasantly situated at the junction of the Towy and its tributary the Bran, and besides the natural attractions of its environs and its first-class fishing, including salmon, it has objects of interest in its churches, school buildings, and the ruins of an ancient castle. West of Llanelly is Kidwelly, on Carmarthen Bay, one of the most historic places in South Wales, with a well-preserved old castle; Ferryside, a pretty little place at the mouth of the river Towy with the ruined castle of Llanstephan on the opposite side of the river, and the county town of Carmarthen on the west bank of the Towy, an old, typically Welsh town, cheerful and quiet, also with the remains of an ancient castle. The Newcastle Emlyn line from Carmarthen passes through beautiful scenery along the river Tivy from Pencader to Newcastle Emlyn, and the river affords excellent sport all the way to its mouth with salmon, sewin and trout. From Llandyssil station on this branch a service of road motor cars plys to New Quay, a little seaside place with golf links and good bathing and fishing, which is growing rapidly. The only place of any importance on the Pencader-Aberystwyth line outside Aberystwyth which ranks among the leading holiday resorts of Britain, is Lampeter, a prominent Welsh educational centre. The country between Aberystwyth and Lampeter will be familiar to readers of Borrow's "Wild Wales." Strata Florida is mentioned, and Tregaron, where Borrow records getting an excellent

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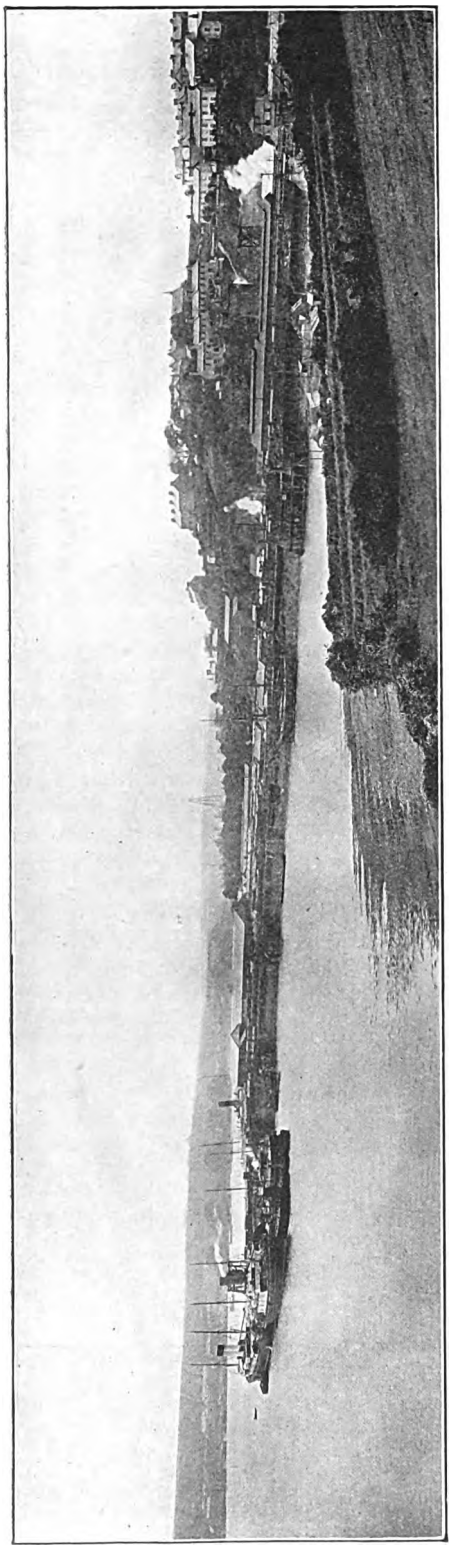

Photo] GENERAL VIEW OF RAILWAY STATION AND DOCKS AT NEYLAND (NEW MILFORD). [G.W.R.

supper and a very comfortable bed, is "the very good place not so big as London, famed for the best ham in all Shire Cardigan and the birthplace of a great man, a clever thief, Twm Shone Catti, who died a rich man, Justice of the Peace and Mayor of Brecon."*

The Cardigan branch line serves, through Crymmych Arms station, the historic seaside village of Newport, Pem.; Kilgerran, once a borough town, with an old castle, and Cardigan, another place owning an ancient castle. Three miles from Cardigan is Gwbert-on-Sea, a splendid little seaside resort on Cardigan Bay, which is attracting more and more people each year. The air here is extremely bracing and the bathing safe. Golf links have been laid out with natural hazards, and a first-class hotel has recently been opened. Gwbert-on-Sea is likely to attain eminence as a holiday place in a very short time. On the Pembroke branch is Tenby, the best-known resort on the south coast of Wales, a sunny sheltered town with everything the visitor can wish for in the way of outdoor amusements; the small resorts of Saundersfoot and Penally are close by. Pembroke is worth visiting on account of its old fortified castle and unique situation above the Cleddau river. Haverfordwest, on the way to Neyland, is a county within a county, having its own Lord Lieutenant, Sheriff and Assizes and Corporation; it is the centre of an historic country and possesses the inevitable castle ruins—they abound in South Wales. A road motor car service of the Great Western Railway connects the "village city" of St. Davids with Haverfordwest.

The most important railway station west of Llanelly on the Great Western Railway is Fishguard. Brunel concluded that the most desirable point for the western terminus would be found at Fishguard Bay, and there was much to recommend this idea. The Bay would accommodate the largest navies in deep water, requiring only the protection of a breakwater to complete the protection afforded on three sides of the Bay by hills. The most desirable point for the construction of the harbour was on the southern shores of the bay; but here the base of the hills rising sheer out of the water to a height of over 300 ft. was formed of the hardest rock. The construction of a harbour, therefore, in addition to the provision of a breakwater, meant a very costly undertaking, and coupled with the engineering difficulties to be faced in making a railway to Fishguard

* "Wild Wales," Borrow, Chapter XCII.

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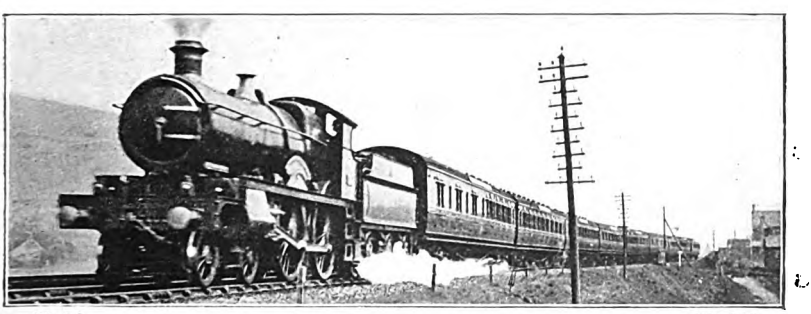
created difficulties insurmountable at the time.

To make the present harbour a huge slice was blasted from the side of the surrounding hills and the space thus cleared with the making of new-made ground secured by constructing a quay wall in the bay and filling in provided an area sufficient for extensive quay space, station buildings, sidings, cattle-pens, power-house, and all the other necessaries and conveniences of a first-class modern port. Over 2,000,000 tons of rock had to be removed from the sides of the hills, as much as 130,000 tons being sometimes displaced by a single explosion. Much of the rock went in the construction of the breakwater. Fishguard Harbour, besides being the port for the steamers sailing to Southern Ireland was used, until recently, as a port of call for the homeward bound Cunard liners from New York and Boston, the steamers of the Booth line from Portugal and South America, and the steamers of the "Blue Funnel" line to Africa and Australia. The Booth line steamers were the first ocean liners to call at Fishguard in 1908, and in the following year the Cunard liner *Mauretania* landed passengers and mails there when a record journey from New York to London was made. On that occasion passengers and mails from New York on a Wednesday were in London on the following Monday, the railway journey from Fishguard to London being performed in just over five hours.

In closing this review of the Great Western Railway in South Wales it is necessary to return to the industrial area of Monmouthshire and Glamorganshire to comment on one of the most interesting features of the railway system in Monmouthshire and Glamorganshire. Tracing the maze of railways in South-East Wales, the point immediately arises in the mind of the high efficiency of the transport facilities due to the east and west railways that link up the number of lines threading their way from north to south to the seaports. To speculate on what the position would be without the transverse line from Pontypool to Swansea *viâ* Nelson and Llancaiach, Quaker's Yard and Aberdare and the Merthyr, Tredegar and Abergavenny line of the London and North Western Railway that links up the northern termini of the Great Western Monmouthshire Valleys lines, and stations of Welsh railways that work southwards to Newport and Cardiff is to give rise to many interesting questions, *e.g.*, assume the non-existence of the Great Western line running west from Pontypool, and the necessity for railway transport from a station on one of the railways running north and south to a station distant as the crow flies a few miles, situated on a neighbouring north and south line, both stations being near the junctions made by the Great Western east and west railway with the lines that they are situated on, then trace the route necessary and compare with that actually in existence. Such examples can be multiplied over and over again, and the Monmouthshire and Glamorganshire coal and iron-fields exhibit remarkable instances of the value of junction railway lines and cross-country link lines.

The Great Western Railway does duty in South Wales to a large extent as a linking line connecting at various points the system of railways of the district, and with the combination of its lateral lines and railways converging on the Welsh ports does much to help in making industrial South Wales one of the best served areas for transport in the Kingdom.



Photo] [G.W.R.

BOAT TRAIN PASSING SKEWEN.

Engine, *County Cardigan.*

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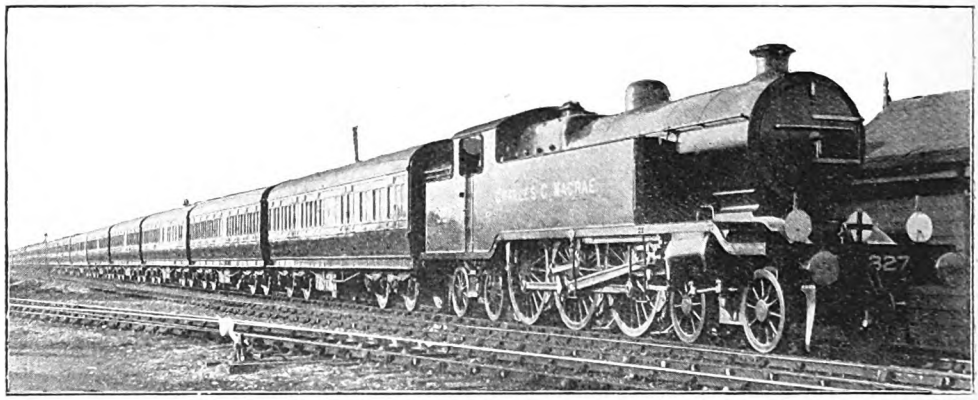
More British-Built Ambulance Trains.

IN connection with the Railway Companies' Annual Meetings a number of references to the construction of ambulance trains are included. Lord Claud Hamilton stated that two trains were built by the Great Eastern Railway in 1914, one for home and one for foreign service; two in 1915 for the Continent; and that two are in course of construction, one for use here and one for abroad. These figures, of course, take into account those constructed for the United Kingdom Flour Millers' Association. Sir George Armytage referred to corresponding work done by the Lancashire and Yorkshire Railway, involving four trains, two for home use and two for abroad.

When the War broke out and arrangements had to be made for the transport of our wounded men the Lancashire and Yorkshire Railway was one of the first to provide an ambulance train to the order of the War Office, subsequent to which other trains have been constructed at their Newton Heath Works. Instructions were recently received to build another train for the use of British troops in France and to include in it all the latest devices for the expeditious and easy movement of wounded soldiers, and under the direction of Mr. George Hughes, Chief Mechanical Engineer, this train has been completed at Newton Heath, Manchester.

In July last, the Lancashire and Yorkshire Railway placed an Ambulance Train on view at Exchange Station, Liverpool, this being the first occasion on which a British railway had adopted such a course. A sum of £300 was realised and devoted to the provision of comforts for the wounded in hospital in the Liverpool District. Having in mind the success attending the exhibition at Liverpool, Mr. John A. F. Aspinall, General Manager, arranged for the latest train to be on view at the more important places served by the Lancashire and Yorkshire line, the tour including Halifax, Manchester, Blackpool, Southport, Liverpool, Blackburn, Bradford, Preston, Bolton, and Huddersfield.

A staff of nurses from the Manchester Auxiliary Hospitals were on the train throughout the tour with the exception of Liverpool. The Red Cross Society and the St. John Ambulance organisations in each of the towns provided detachments of nurses.



AMBULANCE TRAIN FOR CONTINENTAL SERVICE EQUIPPED BY THE LONDON, BRIGHTON AND SOUTH COAST RAILWAY.

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who assisted by disposing of tickets of admission. On the occasion of the exhibition at Liverpool the staffing of the train and the sale of tickets was ably carried out by lady workers under the direction of Lady Barr and Miss M. I. Aspinall.

The public readily availed themselves of the opportunity of seeing how British wounded soldiers are conveyed to the base hospitals on the Continent, and during the exhibition upwards of 46,000 visitors passed through the train, the highest attendance for one day being at Huddersfield when 6,142 paid for admission. About £2,800 was realised, which will be used for providing comforts for wounded soldiers and sailors in the local hospitals and for the troops serving with our Expeditionary Forces. Members of the Lancashire and Yorkshire Railway Centre of the St. John Ambulance Association, in charge of the Centre Secretary (Mr. G. H. Nutter), were also on duty with the train. A souvenir, tastefully got up in red, white, blue and khaki, and giving a description of the train, with illustrations, met with a ready sale, and upwards of 20,000 copies being disposed of.

The exhibition at Liverpool and Bradford was opened by the Lord Mayor, at Manchester by the Deputy Lord Mayor, and at the other towns by the Mayor. The construction and equipment of the train is on somewhat similar lines to the descriptions and illustrations which have appeared in the RAILWAY MAGAZINE from time to time.

Reference has already been made to the exhibition of one of the ambulance trains equipped by the London, Brighton and South Coast Railway, and this also may now be described. A general view of the train is reproduced.

The train consists of sixteen bogie coaches. Two kitchen cars, a pharmacy car, four ward cars, five sitting-up cars (one for infectious cases), a staff car, a personnel car, and two brake vans. The exterior of the train is khaki colour, with a large red cross on a white background on the centre of each car on either side.

In the four ward cars accommodation is provided for 144 beds. The beds are fitted in tiers of three, and as the coaches have elliptical roofs, ample air space is given. Five sitting-up cars provide accommodation for 320 cases, one car with 64 places being set apart for infectious cases; this car has no upholstery, the seats being of perforated three-ply wood.

In the kitchen cars there is a special army range, fitted with a circulating hot-water apparatus with a capacity of 50 gallons of hot water per hour. Water is supplied from two large roof tanks, with a capacity of 150 gallons each. A treatment room, an office, one linen room, and a medical store are in the pharmacy car, which is fitted with an urn and sterilisers, so that an operation may be performed on the train. The staff car furnishes accommodation for medical officers and nurses. This car is self-heated by the Dargue-Griffiths system. The personnel car has accommodation for 28 persons, and is also self-heated by the Dargue-Griffiths system. One brake van has one large and one small store, the other is fitted with two infectious wards, one for 6 and the other for 12 cases, in addition to the guard's accommodation.

The coaches measure 54 and 55 ft. long by 8 ft. 6 in. wide, the whole length of the train being 930 ft. 8 in. over buffers, and weighs 429 tons. Steam-heated and electrically lighted throughout, the train was built at the Brighton Railway's Carriage Works, at Lancing, under the supervision of Mr. A. H. Panter, Carriage and Wagon Superintendent.

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British Railway Service and the War. [III.]

AS was only to be expected, in addressing the shareholders at the annual meetings of the various railway companies, the respective Chairmen had much to say in regard to the services rendered by members of their staffs in connection with the active progress of the war; and this article may appropriately be devoted entirely to such remarks. Space is not available for full reports of each reference, but the main subject matter is presented briefly. Furthermore, only the more illuminating of these references can be included, those which did not proceed into detail necessarily being omitted.

The Glasgow and South Western Railway's roll of honour contains the names of 1,443 employés, of whom 44 have made the supreme sacrifice. Sir James Bell recently stated that but for the employment of female labour in place of the staff absent in the armed forces they should not have been able to carry on the work of the railway as satisfactorily as they had done. They had 645 women now on their pay-lists. Of that number 343 were clerks, and 302 were employed on the wages staff, taking the places of booking clerks, ticket collectors, left luggage attendants, porters, etc., and they had shown themselves to be willing and efficient workers.

Addressing the proprietors of the Great Central Railway, Lord Faringdon paid a splendid tribute to the patriotism and the devotion to duty of the staff. He remarked: "In round figures, 6,000 of our men have joined the Colours, the actual figure, I think, is 6,022. As the total number employed before the war was 34,505, this represents 17·45 per cent. Some are at the front; and I regret to say that our casualties already number 184 killed, 37 missing, 38 prisoners, 490 wounded—a total of 749. There are also the crews of our Hamburg interned steamers, who are, we believe, still at the concentration camp, Ruhleben. The splendid spirit of devotion to their country's needs that urged these men to join the forces has been equally conspicuous among those who have stayed at home. Officers and men have worked extremely hard to maintain the system in a state of efficiency during a period that has made railway operations difficult, and I am glad to believe that things have worked smoothly, and that although a diminution in the passenger train service has been imperative, yet the inconvenience the public have suffered thereby has not been very great."

Lord Claud Hamilton, M.P., has borne testimony which should send a thrill of pride throughout the Great Eastern Railway service: "I am sure," remarked Lord Claud "you would like to know what has been done by our staff in respect of the war. Immediately on the outbreak of war some 1,700 Reservists rejoined the Colours, and by the end of September, 1914, when the Territorials had been embodied, the number of our men serving totalled over 3,000, or about 10 per cent. of the whole. At the present time over 5,730 men, representing 17·3 per cent. of the total staff employed, have been either called or enlisted with the Company's consent, whilst some 150 who have left without permission are known to have joined the Army or Navy. Some 25 of the staff are commissioned officers, the great majority of whom have obtained promotion after serving in the ranks. I regret to record that 209 men have been killed in action or died of wounds, whilst a number have been reported "missing" for many months. The men who have been wounded and have been reported at various hospitals, either in this country or overseas, number some 200 to 300, but there is, unfortunately, reason to believe this in no way represents the total. All these men have been communicated with, and, where possible, visited, and comforts supplied to them, and they feel that the Company and their fellow employés are taking a continuing interest in their welfare. Thirty-seven employés are known to be prisoners of war in Germany, and through the courtesy of the American Express Company either money or parcels of food have been sent to them each week. Several men who have lost an arm or a leg have, after being fitted with artificial limbs, been found suitable employment on our railway. Under the group system 11,100 men out of a total number eligible of 14,100 have, up to the present time, offered themselves for attestation, of which 9,450, or

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67·02 per cent., were accepted. Included in groups 2, 3, 4 and 5, which have been called up, are 1,116 men, and it has been found possible to let 316 of this number join the Colours immediately, and a few others will probably be released later. The following honours of special merit have been won by members of the staff whilst serving with the Forces: Distinguished Conduct Medal—Private A. Kossack, 12th Middlesex Regiment, carriage washer, chief mechanical engineer's department, Stratford; French Medaille Militaire—Gunner E. Childs, Royal Field Artillery, platelayer, chief civil engineer's department, at Leyton."

Sir Frederick G. Banbury, M.P., presiding in place of Lord Allerton, stated that over 14 per cent. of the staff of the Great Northern Railway had joined His Majesty's forces. Of the officers, 53 have received commissions, and Captain H. I. Wykes, of the 6th Batt. of the Wiltshire Regiment, who was assistant to the surveyor, and 2nd Lieutenant J. A. Ross, of the 17th County of London Regiment, one of the solicitor's assistants, have been killed in action. Their names, together with those of 181 other members of the staff who have given their lives for their country, are recorded on the Great Northern Railway Roll of Honour. Sergeant Leadbeater, of the Lincoln Regiment, who before the war was employed at Louth, has been awarded the D.C.M., and later on had a clasp for a further gallant action. Private Gratton, of the 1st Leicestershire Regiment, who was at Derby, has the D.C.M., as well as Lance-Corporal Pacey, of Doncaster, of the 6th Batt. of the K.O.Y.L.I. Driver C. Carter, of Potters Bar, in the Army Service Corps, has received the French Medaille Militaire pour valeur et discipline.

From the staff of the Great North of Scotland Railway 311 men have joined the Colours, this number being about 11½ per cent. and in addition about 850 have attested under the Lord Derby scheme. Sir David Stewart has drawn the attention of the shareholders to the provision made in the accounts for allowances for the dependents of the fighting men. Of the latter, he regretted to say, 11 had already lost their lives. The staff of the Great North of Scotland Railway invested in the last War Loan to the extent of £5,000 and they are now paying the money by instalments out of their weekly wages.

Dealing with the difficulties encountered in railway working during war time Viscount Churchill, addressing the recent general meeting of the proprietors of the Great Western Railway remarked: "Of course, these difficulties are very much increased owing to the fact that a large number of our employés are serving with the Colours. Last year I told you that the number was upwards of 10,000. It has now been increased to over 16,000—and I am sure you will agree that this contribution to the forces is one of which we may all be proud. In addition 25,000 of our men have attested under Lord Derby's scheme, and every effort will be made to allow as large a percentage as possible to be called up when the time comes for the groups which they are enrolled in. We have to deplore the loss of no less than 396 of our men, who have given their lives in the service of their country, and whose names we have had inscribed on the Roll of Honour. The places of the men who have joined the Colours are only partially filled, and this has been done mostly by temporary staff, and by women where we find they are able to fulfil the work satisfactorily."

At Manchester, Sir George Armytage, addressing the annual gathering of Lancashire and Yorkshire Railway shareholders, stated: "I told you twelve months ago that 4,189 members of the staff had enlisted in His Majesty's Forces, and I added that having regard to the efficient working of the railways, which, during the present crisis, is of such supreme importance in the interests of the State, instructions had been given at the request of the military authorities that no further railwaymen should be allowed to enlist without the expressed sanction of their superior officer. I am glad to state that we have by the employment of female labour and the readjustment of duties, including the abolition of some returns, been able to send more men into the Army and Navy, and the number who have now left to join is approaching 7,000. All employés of military age who wished to attest under Lord Derby's System have been allowed to do so, but it was considered essential that the railways should retain the authority of saying which men can be spared for active service in His Majesty's Forces. Arrangements were made by the Railway Executive Committee with the Director-General of Recruiting that with the permission of the companies concerned men might be attested, but that they should return to their civil employment on the railway until such time as the company can release them for service with the Colours.

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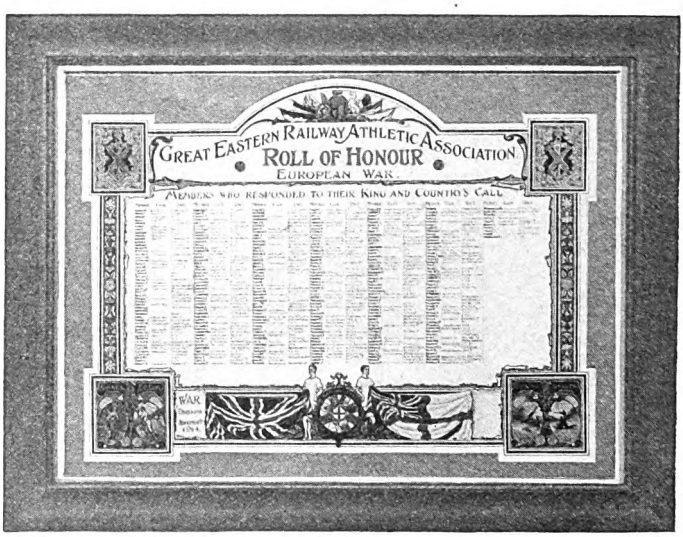
Each man's case is carefully considered, and if it is possible by the employment of female labour or by other means, he is released. At the present time, in addition to those who are actually serving, 12,500 members of the staff have attested, but many of these men cannot be liberated for reasons previously stated. Up to the present date, 204 of the men have lost their lives in the service of the country. As I explained last year, the Company, in conjunction with other railways have adopted a scheme for supplementing the Government allowances to the men's dependents by such amounts as will ensure their families being able to keep their homes together without undue hardship."

Sir Gilbert H. Claughton's contribution on the subject so far as concerns the London and North Western Railway is well worthy of recapitulation: "At our meeting a year ago," said he, "I mentioned that the Government had requisitioned four of our largest steamers, the *Hibernia*, *Anglia*, *Scotia*, and *Cambria*; but I am sorry to say that in the case of two of them their days of usefulness are over, the *Hibernia*, which had been renamed the *Tara*, having been torpedoed by a submarine, and the *Anglia* having been sunk by a mine. The *Hibernia* or *Tara*, whilst engaged as an armed boarding steamer, was attacked by two enemy submarines in the Eastern Mediterranean and sunk. The crew included 89 North Western men, 10 of whom lost their lives at the time of the catastrophe, and one has since died of wounds. Of the remaining 78, 75 are known to have been saved, and in the other three cases the evidence is not absolutely conclusive, all three surnames being the same (Jones), and discrepancies existing with regard to initials. This matter is, however, being followed up with the Admiralty. However, a letter has been received from Captain Tanner stating that they are prisoners of war in the hands of the Turks, at Marsa Matruh, in Tripoli. They are all well, and are being well treated, and have plenty to eat, but nothing to smoke or read, a condition of affairs we are endeavouring to remedy."

"The *Anglia* was sunk through striking a mine in the English Channel, whilst engaged as a hospital carrier, as a result of which a number of persons lost their lives, 25 of whom were North Western men, forming a portion of the crew of the boat. The survivors, numbering 30, all North



ATHLETIC ASSOCIATION ROLL OF HONOUR: GREAT EASTERN RAILWAY.

The Great Eastern Railway Athletic Association has supplied over 300 men to His Majesty's Forces; and to ensure an adequate and lasting record, the association has had an artistic illuminated Roll of Honour prepared, whereon are shown the names of those members who are serving with the Forces. This hangs in the 1st Class Waiting Room at Liverpool Street Station, London, Main Line Booking Hall.

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Western men, were allowed 14 days' leave with pay, and were then drafted to other posts, with the exception of five who had to remain away from work for a somewhat longer period through not having sufficiently recovered, and four whom it was necessary to remove to hospital. Of these latter three only are now away from duty.

"You will also have observed from the report," continued Sir Gilbert, "that no fewer than 17,996 of our staff—greatly increased since then—or over 19 per cent., have responded to the call to the Colours, and of whom 50 have received honours or have been mentioned in despatches for meritorious service, but the list of casualties is unfortunately a sad one, namely: 453 killed in action, drowned, etc.; 207 died from wounds, etc.; 4 missing and presumed dead; 168 missing; 2,407 wounded, sick, etc., of whom 1,591 have returned to their military and naval duties, and 169 prisoners of war."

War service touches the London and South Western as much as—perhaps more than—any railway in the British Isles and Sir William W. Portal, the deputy-chairman, made suitable reference at the recent meeting at Waterloo Station, London, S.E. He remarked: "You will probably like to have a few particulars as to the Company's men who have joined the Forces. The number on January 31st, 1916, was 3,312. The percentage of total number employed was 13·6; and the number who have died from various causes whilst on active service is 104. The Roll of Honour affords testimony of the sacrifices which have been incurred, and it should be noted also that those figures do not include the men who have attested under Lord Derby's scheme. Last year reference was made to the splendid work done by our chief officers and every department, and I think it only right that you should know that in spite of, if possible, greater difficulties, in spite of our staff being greatly depleted through so many of them going to the Front and our having to take on others without experience, and also a considerable number of women, the work has been well carried on, and we all owe a great debt of gratitude to Sir Herbert Walker, the chief officers, and the whole of our staff, for the ready and patriotic way in which they have put their shoulder to the wheel."

Before proceeding with business matters the Earl of Bessborough at the London, Brighton and South Coast Railway meeting said: "This is the second year we meet under war conditions. I should like to tell you what our staff are doing. The number of men who have responded to the call of duty is 2,884, being a little over 17 per cent. We have received information that 118 of our men have given their lives for their country, and their names are inscribed on the Roll of Honour. Then, 237 have been wounded, or are prisoners of war, or are reported as missing. So far as we can, we are keeping in touch with all of those. One of our principal officers, Staff Captain Rose, was badly wounded and taken prisoner at the end of September last. I should like to mention cases in which distinctions have been conferred upon members of our staff. These are: T. Kemp, employed as a carriage cleaner, but now bombardier in the Royal Field Artillery, awarded the D.C.M. for conspicuous bravery in serving his gun; J. J. Ingram, employed as an assistant fitter in the electrical department—who was a corporal in the Coldstream Guards—was awarded the D.C.M. for conspicuous gallantry in the trenches, but he was subsequently killed in action; G. W. Williams, employed as a wagon maker, now a sapper in the Royal Engineers, awarded the D.C.M. for conspicuous bravery; and A. Hutchence, an assistant in the office of the superintendent of the line, now a captain in the 21st Battalion of the County of London Regiment, mentioned in despatches, and awarded the Military Cross."

Up to the end of last year 12,491 men from the salaried and wages staffs of the Midland Railway had enlisted in either the Army or the Navy. Of these 568 had been discharged on medical or other grounds, so that the number actually detached from the railway is 11,923, or 17 per cent. of the total staff. Out of this number, 457 have been killed or died of wounds; 63 are reported as missing; 1,111 have been wounded or invalided home; and 110 are prisoners of war, a total of 1,741 coming under the head of casualties. One hundred and nine members of the staff have been given commissions, and 14 men have earned honours for gallant conduct in the field, namely, 7 have received the D.C.M., 3 have received the French Military Cross, 1 has been granted a commission, and 3 have been either mentioned in despatches or received commendation. RAILWAY MAGAZINE readers will agree with Mr. George Murray Smith that this is a good record, and Midland Railway shareholders are proud to be associated with such gallant railwaymen, though pride is mingled with regret

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Some G. E. R. Representatives with His Majesty's Forces.

1.	Private H. S. Burgess	.. ..	.. Electrical Department.
2.	Private W. M. Arnold	.. Army Service Corps	.. Chief Traffic Manager's Department.
3.	Private S. H. Palmer	.. Loyal Suffolk Hussars	.. Chief Traffic Manager's Department.
4.	Private C. P. Parker	.. 5th City of London ..	.. Land Agent's Department.
5.	W. H. Tebby	.. Royal Field Artillery	.. Chief Traffic Manager's Department.
6.	Private G. H. Croxford	.. 4th Lincs.	.. Locomotive Department.
7.	Private F. W. Tarry	.. 4th Lincs.	.. Locomotive Department.
8.	Private W. H. Goodhind	.. 5th York Infantry ..	.. Locomotive Department.

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that so many have lost their lives, and so many have been wounded in fighting for their country. When Lord Derby's recruiting scheme was introduced there were 29,993 Midland Railway staff of military age, and of these 85 per cent. immediately offered themselves; this number was gradually increased so that according to the latest figures given at the annual meeting only about 2,000 eligibles were still unattested.

Prominent among Midland Railway men who have obtained credit and renown during the war is Lieutenant Albert E. Haynes, Royal Artillery, who was mentioned in Sir Ian Hamilton's Gallipoli despatches and has since been awarded the Military Cross. Lieutenant Haynes in railway service was the assistant divisional locomotive superintendent at Leeds.

At the end of the year 1915 over 10,000 North Eastern Railway men—being 18 per cent. of the total staff—had enlisted in either the Navy or the Army, and the total number released to the Colours to-day approaches 11,000. Over 18,700 presented themselves for attestation under the group system, so that altogether nearly 30,000 North Eastern Railway men, or well over 90 per cent. of the male staff of military age, have presented themselves for naval or military service. One hundred and twenty members of the staff hold His Majesty's commission, 36 of them having been promoted from the ranks. Eighteen North Eastern Railway men have won the D.C.M., or other distinctions in the field.

A very high percentage of the staff of the London Electric Railway have joined the armed forces of the Crown. Of this witness was borne by Lord Farrer. The total number of men in service prior to the war was 3,007. Of these 972 have enlisted, which represents 32 per cent. of the whole. In addition, 975 have attested, so that over 64 per cent. of the staff have either enlisted or volunteered for war service. "I deeply regret," said Lord Farrer, "having to add that our casualties number 68, of which 18 have been killed. We are replacing a number of the men, who are absent on war service, with women, and I am glad to be able to say that they are, generally speaking, performing their duties with commendable accuracy and skill."

At the Mersey Railway meeting Mr. James Falconer, M.P., was able to say that the staff had behaved with conspicuous loyalty during the war. About 20 per cent. of the staff had gone to the front—practically all who were of military age, and who could by any possibility be spared. Not only had they done that, but those who had been left behind had been most ready and most considerate in adapting themselves to the new conditions, and had done everything they could to help the railway to run without friction.

Sir Charles B. Renshaw mentioned that over 3,000 members of the staff of the Caledonian Railway are serving in the Army. Wherever possible women are employed to fill the vacancies.

Shortly after the war commenced about 12 per cent. of the staff of the Liverpool Overhead Railway joined the fighting forces and several of them have since been wounded. Women have filled vacancies as far as possible. There are now about 50 females employed on the railway as booking clerks, ticket collectors, lift attendants and carriage cleaners.

Of North Staffordshire Railway staff 701 men of military age have joined the Colours, making 21 per cent. of those eligible. About 1,900 have attested. Twenty-three of the men in the fighting forces have been killed in action or died while serving.

Speaking at the Taff Vale meeting, Sir Joseph Weston-Stevens said that 787 of the employés had enlisted and 1,573 had attested under Lord Derby's Scheme. He regretted that 19 had given up their lives. They had replaced a number of men, but it would be readily realised that they were not so young or so experienced as those who had left. And they had also endeavoured to fill certain positions with women. This was a trying time, and business was much upset. New problems arose to be solved, and he desired to express their hearty thanks to the general manager and other officials for the good work they had done during the past year. And he was sure he should be expressing the feeling of the meeting by offering congratulations to their colleague on the Board, Lord Rhondda, on the fortunate escape of himself and his daughter from the *Lusitania* disaster.

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British Railway War Work.

NONE but the most carping of critics will be inclined to disagree with Lord Claud Hamilton's admirably expressed conclusions in regard to the work of the Railway Executive Committee, which, as RAILWAY MAGAZINE readers are aware, has controlled British railways on behalf of the Government since the outbreak of war, in August, 1914. Dealing with the Great Eastern Railway working during 1915, Lord Claud remarked: "I do not believe these good results could have been attained had it not been for the admirable management of the Committee of General Managers, under the chairmanship of Sir Herbert Walker, General Manager of the London and South Western Railway. The first function, and the imperative duty, of that committee, has been to give priority to everything demanded by the Government for the successful prosecution of the war, and they have performed those duties with such conspicuous ability that, whilst all Government work has proceeded swiftly, quietly, and with the utmost secrecy, the general traffic of the railways has been subjected to a minimum amount of interruption."

During 1915, the Great Eastern Railway ran no fewer than 8,374 passenger and 3,634 goods trains exclusively for military purposes, which gives an average of 230 per week, and 32 per day. The train mileage run exclusively for military purposes was 421,797 miles on account of passengers, and 103,744 miles on account of goods, a total mileage of 525,541 miles.

Throughout the year 1915, the Metropolitan Railway continued to convey large quantities of Government material and stores, particularly over the section known as the "widened lines" in the City, which connect the Great Northern and Midland on the North with the South Eastern and Brighton systems in the South. It was found necessary to suspend the passenger service except during the busy hours, morning and evening, to enable a number of additional goods trains to pass through. The services on the Circle line are being largely used by troops travelling between the main line termini, and a considerable traffic has passed to and from the camp at Wendover.

In addition to carrying war traffic by goods and passenger trains, the North Eastern Railway has rendered exceptional services in other directions. The North Eastern Railway workshops are producing a large quantity of munitions. The War Office would not wish the exact number of shells to be given, but the output is very considerable, and it largely exceeds the original estimate. The new shop, where most of this shell work is carried on, was not started until the end of August last, but it was not then fully equipped with machines, and the women had to be taught, and it really had only got into full swing at the end of September. In the North Eastern locomotive shops, a large amount of work in connection with gun mountings, and gun carriages, and repairing fired cartridge cases is done.

In the carriage and wagon works have been built nearly 1,000 general service wagons, and over 2,000 stretchers, and in addition to forgings and machine work for armament firms. The North Eastern employs a large number of women in these works, and their work has been remarkably good. The company has also been able to do a very important service to the country by putting at its disposal the services of capable officials in the persons of Mr. Geddes, Mr. Raven, and Mr. Wedgwood. Mr. Raven is now Acting Chief Superintendent of the Royal Ordnance Factories—a most distinguished and important post.

It is claimed by Mr. H. Cosmo Bonsor that the lines controlled by the South Eastern and Chatham Railway Companies Managing Committee have carried, in proportion to their length, more military traffic since the outbreak of war, than any other system in the United Kingdom. He points out that they have been running on an average over one hundred special trains a day for the Government. The principal increase is in heavy traffic—goods and minerals. At one busy station the goods traffic has increased by upwards of 300 per cent. The South Eastern and Chatham Railway was formerly called a passenger line, while

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the northern lines, which had a much larger proportion of goods traffic, were called heavy lines. War has converted the "Chatham" from a passenger line into a heavy line, and with this important and new traffic thrown upon the traffic management without those facilities which the northern lines possess. The closing of sea-borne traffic (that is, of traffic carried by water to the ports of Kent and on the river) has also added considerably to the difficulties. There are now a very large number of trains from the north carrying goods to be despatched to localities in Kent. This heavy amount of goods traffic has caused a reduction of the passenger train service, with consequent overcrowding and slow running. Continental passenger traffic on the South Eastern and Chatham system is most irregular owing to the very necessary restrictions made by the Admiralty, which, coupled with the Government's lighting restrictions, causes frequent unavoidable delays in traffic working. All who have even an elementary knowledge of the adverse circumstances in which the officials and staff of the South Eastern and Chatham Railway are working their enormously enhanced traffic, will cordially endorse Mr. H. Cosmo Bonsor's remarks at the shareholders' meeting, where he paid a well deserved tribute to the staff from the highest to the lowest.

As many RAILWAY MAGAZINE readers know, the Furness Railway had a very large traffic to deal with during the year 1915—one of the largest on record—having conveyed considerable quantities of Government munitions and stores over the line, and also raw materials, and, although there has been at times some congestion of traffic, particularly at Barrow, on the whole the business was carried through in a satisfactory manner. All this has been a severe tax on the locomotive department for engine power, and the difficulties have been increased by many men having been allowed to join the Colours in the early part of the war. Two more engines for renewals are being ordered; it is hoped that the four which were ordered in March, 1915, will, by the aid of the Ministry of Munitions, be delivered shortly. With these engines it is expected to get through with the large traffic, which will, no doubt, continue during the war, without having to order additional engines on capital account. Great difficulty has been experienced in supplying wagons for the iron and steel industries throughout the Furness district and in West Cumberland, but the company have hired from South Wales 181 ten and twelve ton wagons until the end of 1916. They have tried to get more wagons on the hire system, but as the only additional offer they did obtain was on hire-purchase, they did not see their way to obtain wagons on this basis.

Furness Railway train miles run for the goods and mineral traffic in 1915 show an increase of 10 per cent. over those of 1914, and the tonnage an increase of 13 per cent. over 1914. Messrs. Vickers' traffic at Barrow nearly doubled itself in the year 1915 compared with 1914, and is five times as large as it was ten years ago.

At the annual meeting of the proprietors of the Furness Railway, Mr. Alfred Aslett, the General Manager and Secretary, explained the difficulties through which they had passed with the heavy traffic which had been dealt with during the year 1915, and which had engaged the most serious consideration of the superintendent of the line, goods manager, and locomotive superintendent, as well as himself. He stated that from a census taken on December 26th, 1915, at Barrow there were 1,447 wagons standing in the sidings and on the Barrow Docks consigned to Messrs. Vickers, which number had been gradually brought down to 419, which in itself proved that nothing had been left undone on the part of the Furness Railway to deal with the traffic in a satisfactory manner. The Furness Railway certainly welcomed, and even invited, the intervention of the Railway Executive Committee and the Ministry of Munitions, and several important meetings had taken place in connection with this congestion. With regard to the iron ore for the Carnforth Iron Works, Mr. Aslett stated that the Furness Company had strongly objected to this ore being brought to Barrow during the congestion, but owing to some trouble at Heysham it could not be prevented.

Lord Faringdon, at the Great Central Railway meeting, did not furnish exact particulars of the amount of war work performed on that line, but, like other railway chairmen, gave credit to the officers and staff for the excellent way in which the additional traffic had been handled. He remarked: "As an indication of the amount of traffic we have dealt with during the year 1915, I find that, taking commercial merchandise alone, and excluding altogether everything that has been carried for the

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naval and military authorities, that amounted to £81,000 more than in the previous year. If you consider what the earning of this additional £81,000 means, with all the traffic that has been thrown on our line in almost every direction by the naval and military authorities, you will be able to gauge to some extent the amount of work the railway has had to do."

In reply to two questions, Lord Faringdon answered that, on the whole, their female labour was distinctly satisfactory. Some of the women were new to the work, but showed every disposition of becoming extremely able workers. As to insurance against Zeppelins, so far as the railway proper was concerned, no insurance of any kind was effected, because the line was leased to the Government for the time being, and the Government took all responsibility in connection with their line. As regarded the rental properties, those were insured against air risks.

As an instance in which the British Government has benefited in war time by railway enterprise in the days of peace, reference may be made to the King George Dock, Hull, jointly owned by the Hull and Barnsley and North Eastern Railways. Opened by His Majesty the King on June 26th, 1914, it was available for traffic on August 1st, a few days before the outbreak of hostilities between Great Britain and Germany. The dock has been largely used by the Government for the housing and training of troops, and for naval and military purposes generally, which has materially limited accommodation available for ordinary trade. The troops were withdrawn from the dock in June last; since that time a large quantity of Government work has there been dealt with, and in spite of that there has been a considerable development of general business, which is likely to grow in the future, and the dock will without doubt prove to be a valuable addition to the facilities of the port.

Both at the Horwich and Newton Heath works, Lancashire and Yorkshire Railway, are busily engaged on Government work. Since the commencement of war four ambulance trains have been built, two for use in Great Britain and two for service abroad. Almost the whole of the steam vessels on the East Coast are still engaged on national service, although two are still detained in Hamburg, as they have been since the beginning of the war. The joint mail service between Fleetwood and Belfast is still maintained, although the Fleet has been depleted for Government purposes. The Liverpool and Drogheda service is running as usual.

In addition to a vast amount of war work for the Government, the Midland Railway is dealing with a greatly increased coal and goods traffic. The Chief Mechanical Engineer's and the Carriage and Wagon Departments, in addition to working at high pressure on the railway's own work, likewise turn out large quantities of munitions for the prosecution of the war.

On the subject of railways and war work, Sir Gilbert Claughton Chairman, London and North Western Railway, inquired: "Need I dilate upon what the Company, in friendly rivalry with its competitors, has done directly and indirectly in the interests of the war? The shareholders may fairly be proud of the record—indeed the Board are so, when month by month we have the detailed report of the numbers who have voluntarily joined the Forces; the record of those who have thus joined; the demand of the Authorities for more of the same sort; the heavy demand for special military trains run for the Government; added to the largest gross traffic in any year in the history of the Company—we have carried over 1,000,000 tons more in 1915 than in 1913—and when we look at what is being done at our various workshops for, and by officials we have lent to, the Ministry of Munitions, which the Government has gratefully acknowledged, one wonders how the line has been kept running in its still excellent form."

London and South Western Railway shareholders have to thank their Deputy-Chairman of Directors, Sir William Wyndham Portal, for a very clear statement of the relations between the railway and the Government in regard to maintenance. He informed them that when the agreement with the Government was first entered into, it was foreseen that owing to the probable shortage of men and materials, and to the extensive use of stock that would be required for military purposes, it would be impossible for the railway companies to maintain their permanent way, locomotives, carriages and wagons in that high state of efficiency which is usual in this country. The Government at once agreed that the railway companies might have a claim for the period of control for the amount that the companies would have to spend in bringing their railways and stock up to its normal state of efficiency. The duration of the war, and, therefore, the

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length of the period of control, are, however, likely to extend beyond what was contemplated. The difficulty of obtaining men and materials is more acute than was anticipated and it is felt that it would be wrong to defer until the end of the period of control the submitting of claims on the part of the railway companies for deferred maintenance. An arrangement has, therefore, been entered into with the Government that the railway companies shall submit periodical statements of unspent amounts on the maintenance of their permanent way, locomotives, carriages and wagons, and the basis of the claim has been settled with the Treasury Authorities. The claims for the first period of control are in course of preparation. It must not be thought from this that the upkeep of the railways in this country is getting seriously in arrears; the fact that the railways are at the present time dealing with a very much bigger traffic than they have ever been called upon to carry proves this, but we have suffered in the progress of renewal work, and in the keeping up of small details of repair, cleaning, repainting, etc., of stations, locomotives, and carriages.

Viscount Churchill, in addressing the proprietors of the Great Western Railway, stated that he might be asked whether the directors were satisfied that the results of the arrangement with the Government have been beneficial to the interests of the Great Western Railway. "My answer to that," said Lord Churchill, "is that in the extraordinary circumstances in which the country is placed by being plunged into a European war, the magnitude of which we only know too well, and in which the railways of this country must play a very important part, it was necessary to take a very broad and patriotic view of the circumstances. It has been abundantly shown that the arrangement by which the railways became placed at the disposal of the Government for the movement of men, material, and munitions, while at the same time their management remained in the hands of the companies, has been completely justified by results, and the manner in which the enormous amount of traffic has been carried, does the greatest credit to all our employés who have been engaged in it. As to the financial side of the arrangement, there can be no doubt whatever but that the Government has received full value in return for the compensation which they are paying us."

War has produced a difficulty on the North British Railway in connection with wagon supply, resulting, largely, from the scarcity of labour and difficulty in obtaining materials to keep wagons satisfactorily repaired. It had been suggested that much of this difficulty might be overcome so far as Scotland is concerned if the wagons of the various Scottish companies were pooled and so made available for use by any of the companies. It is, however, the opinion of Mr. Whitelaw, the North British Chairman, that even if it were found practicable to arrange a pool of the wagons owned by the Scottish railway companies, the benefit might easily be over-estimated. He considers it essential to the attainment of any great advantage that the wagons of the whole railway companies of Great Britain should be placed in one common pool, and that wagons owned privately by traders should also be included.

Since October last the Glasgow and South Western Railway has been handling a large quantity of the Admiralty coal for the use of the Fleet, the Admiralty having decided what the Company should deal with. Under the arrangement come to they have hauled an immense tonnage, which, in addition to their other heavy traffic, has had the effect of straining their locomotive requirements to the utmost.

In Ireland the railways have not been behind in "doing their bit" of war work. At Inchicore, the well-equipped works of the Great Southern and Western Railway, the staff, under the able direction of Mr. Watson, and assisted by many volunteers, have done much good munition work for the Government, thus demonstrating their ardent desire to back up the gallant fellows in the fighting forces. The weekly output at Inchicore is now 3,000 fuse bodies, against the 500 they undertook to deliver.

In the latter part of last year the Midland Great Western Railway was asked by the Government to place a part of the Company's works at their disposal for the manufacture of certain war materials. The directors acceded to the request, and it is stated that work that is being done is greatly appreciated by the Government's officials.

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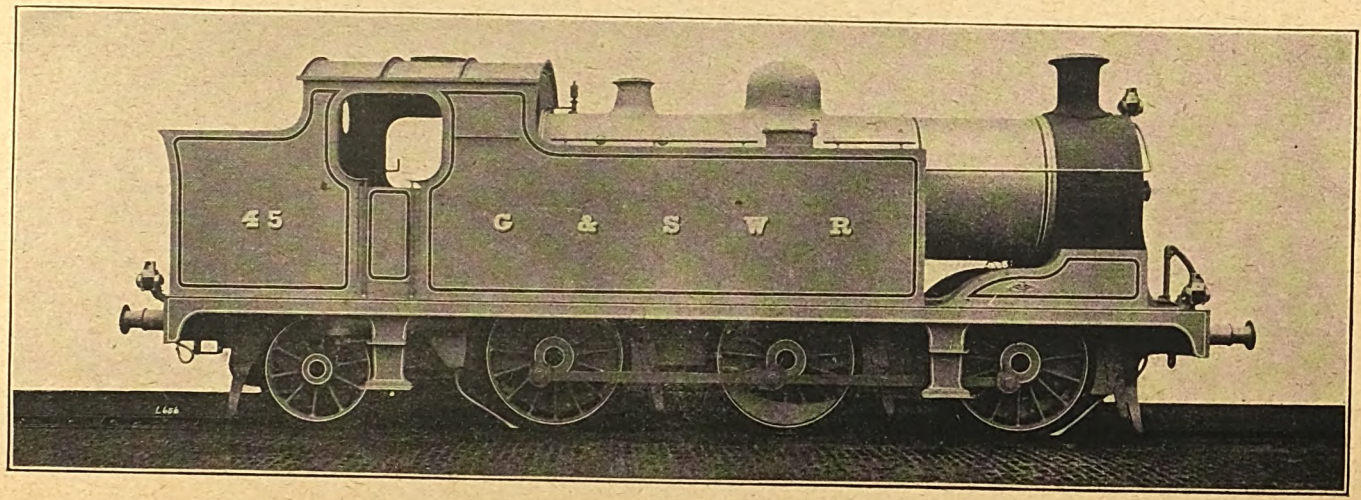
0-6-2 TANK ENGINE: GLASGOW AND SOUTH WESTERN RAILWAY.

Designed by Mr. P. Drummond, Locomotive Superintendent.



THIS series of six engines inaugurates the 0-6-2 type for tank engines on the Glasgow and South Western Railway, and the engines constitute a considerable advance upon tank engines hitherto in service on this line. Leading dimensions are as follows:—

Cylinders	18¼ in. × 26 in.	Heating surface, tubes	1,143·97 sq. ft.
Coupled wheels	5 ft. diameter.	,, ,, firebox	118·12 ,,
Trailing wheels	4 ft. diameter.		
Coupled wheelbase	15 ft.	,, ,, total	1,262·09 ,,
Total wheelbase	22 ft. 9 in.	Grate area	22·43 ,,
Steam pressure	180 lbs. per sq. in.	Tank capacity	1,800 galls.
		Coal ,,	3 tons.

Weight in working order .. 65 tons.

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PERTINENT PARAGRAPHS

Government Compensation for New Works Necessarily Unremunerative as Such.

An important point was raised at several of the railway companies' annual meetings. It was first mentioned by Lord Aberconway, addressing the shareholders of the Metropolitan Railway in reference to the widenings between Finchley Road and Wembley Park. These are now completed, and the Government has the benefit of the increased facilities. The Company cannot, however, develop as they otherwise would have done to realise the benefit of the capital expenditure involved, though they have to bear the interest upon such capital. Lord Faringdon, at the Great Central Railway meeting, referred to other aspects of similar conditions. On the South Eastern and Chatham Railway, when war broke out in August, 1914, they were looking forward to a very large development owing to the heavy capital expenditure made in previous years on the Dover Marine station, and on improvements in giving greater facilities at Margate and at other stations. War deprived the company of that benefit. Practically, as Mr. Bonsor expressed it, they "get nothing for the big outlay of capital made in the years previous to the war." The Furness Railway also introduced other variations of the difficulty. Lord Muncaster remarked: "Whether some modification in the agreement will be made by the Government is a matter which we have now under consideration with the Railway Executive Committee, as it is a question which greatly affects the interests of shareholders." The matter is, however, receiving attention, and there is every prospect that a reasonable and equitable arrangement will be arrived at. Expressing this view, Lord Aberconway stated: "As a number of other companies are similarly affected, representations have been made to the Government in regard to it, and I think there is no doubt that some allowance will be made to us by way of compensation."

Over 100 miles at 62 m.p.h. average.

In view of Mr. Allen's article last month dealing largely with the achievements of Great Western locomotives on high speed schedules, the following notes of a recent editorial experience will be of interest. The train was the 11.5 a.m. down express from Paddington, made up of three vehicles for the Bridgwater portion, one restaurant car, three vehicles for Penzance, and two for the "Bath Spa" express. The last mentioned were slipped at Bath. All were of the large 70 ft. designs. Weather was favourable, and the train fairly loaded. The engine was No. 4002, *Evening Star*, four-cylinder 4–6–0.

Initial stages of the journey were merely steady, and it was not until about West Drayton that the mile-a-minute rate was reached. Slough (18½ miles) was passed in 22 min. 10 sec., and Reading (36 miles) in 39 min. After Slough, the rate had become a steady 65-70 miles per hour, and this continued with little variation, except that the Swindon-Bathampton stage was very fast, until the necessary check for Bath. The various stages were:—Slough-Reading, 17½ miles, 16 min. 50 sec.; Reading-Didcot, 17 miles, 15 min. 55 sec.; Didcot-Swindon, 24¼ miles, 23 min. 20 sec.; and Swindon-Bathampton, 27¼ miles, 23 min. 10 sec. Approach to Bath and the slack were very careful, although terminating a run of 29½ miles (from Swindon) in 25 min. 30 sec.; but nevertheless we passed through Bath station, 106¾ miles from London, in 103 min. 45 sec. Good running was made onwards, but the approach to Temple Meads station was exceptionally steady. This section of 11¾ miles was, however, covered in 13½ min. The net result was that the complete run of 118½ miles from London to Bristol had been made in 117¼ min.; and the Paddington-Bath stage occupied 103¾ min. Yet except in the neighbourhood of Chippenham and Dauntsey speed never greatly exceeded 70 miles per hour, and the run as a whole was characterised by exceptionally steady running.

A return journey may also be mentioned. Load consisted of six 70 ft. coaches, one restaurant car and a 70 ft. coach for the Reading "Slip," the train being the 5.5 p.m. up from Bristol *via* Badminton. Engine was No. 2921, *St. Dunstan*, and the weather unfavourable, the last 80 miles or so being through a snowstorm. The start—5½ min. late—was very slow, but after passing Filton Junction (4¾ miles, 11 min.), speed ranged high all the way thence to Wootton Bassett. This section of 29¾ miles was covered in 29½ min., but from Chipping Sodbury to Brinkworth, the 17½ miles were run in 16 min., and speed ranged well over 75 miles per hour for several miles, the maximum being 84 miles per hour near

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Little Somerford. At Wootton Bassett there was a very slight check, but high speed ruled through Swindon and Shrivenham, and the total time for the 38¼ miles to the latter station from Winterbourne was only 36¼ min. At Uffington there was a severe signal check, and in view of the snowstorm it was not surprising that matters were taken steadily thereafter. However, even then, the 66½ miles from Uffington to London, including the slack for the platform line at Reading to detach the slip coach, took only 69 min. 10 sec. From Badminton (100 miles) the inclusive time was 100½ min., and from Bristol (117½ miles), 125 min. 50 sec.

A "Cosmopolitan" Railway Journey.

Mr. Philip F. Groves writes in reference to a railway train service peculiarity which appears of sufficient interest for attention. His letter may be quoted nearly in full, as follows :—" A visit to Brecon recently reminded me of the curious means whereby Midland Railway trains reach the section of line between Ynisygeinon Junction (3¼ miles north of Pontardawe station) and Swansea. The lines of no fewer than four foreign companies have to be used to secure a through run between the Midland system proper (at Stoke Works station) and this stretch of line. Moreover, if the Great Western and London and North Western joint lines which have to be traversed at Hereford be counted as belonging to two companies, then the number of foreign railways traversed becomes five. From Stoke Works through Worcester to Shelwick Junction is just under 37 miles over the Great Western line. The latter point is where the Great Western and London and North Western joint line from Shrewsbury joins the former company's line from Worcester, two miles east of Hereford station. These two miles of joint line are then traversed by the trains in question, after which they run over a section of 26¾ miles to Three Cocks Junction station, whence the Mid-Wales line of the Cambrian Railways is used through Talgarth for 7½ miles to Tal-y-llyn Junction station. Here both the Midland and Cambrian lines commence to exercise running powers over Brecon and Merthyr metals (from Newport, Merthyr, etc.), which are used as far as Brecon Joint station, where an end-on junction is made with the Neath and Brecon Railway. Cambrian trains all terminate at Brecon, also those of the Merthyr company, but Midland trains continue over the Neath and Brecon Railway to Ynisygeinon Junction, where the last change of railway is made on to the Midland Railway branch from Brynamman and Ystalyfera to Swansea. The only trains that run through from beyond Stoke Works Junction (near Bromsgrove on the Birmingham–Bristol line) to Swansea and Brecon are a few goods trains. However, all engines and carriages for working the service between Hereford, Brecon and Swansea, and on the Brynamman branch, have to be brought down by the route described. The engines are stationed at Brecon and Upper Bank (Swansea). Another curious point is that the Neath and Brecon Railway does not work any trains between Brecon and Ynisygeinon Junction, but confines its activities to the branch from Colbren Junction, a station on the Brecon-Ynisygeinon section, to Neath, all work on the 'main line' being done by the Midland. It is worthy of note that the second class still survives on the Colbren-Neath section (11 miles) of the Neath and Brecon Railway. The total length of foreign line worked over by Midland trains from Birmingham (where most of them start) to Swansea is slightly under 79 miles."

Progress of Works on the London and North Western Railway.

Mr. E. C. Trench, Chief Engineer, reports that the alterations at Euston have been completed. The new rooms adjoin the Great Hall, and comprise dining, smoking, refreshment, and tea rooms. A new booking hall has been built extending along the front of the station and facing the Court Yard, and there are other minor improvements. The section of the new line between Queen's Park and Willesden was opened for traffic on May 10th last, when the London Electric Railway service of trains running from Waterloo to Queen's Park *viâ* Charing Cross, Baker Street, and Paddington, was extended to Willesden Junction. Between Chalk Farm and Queen's Park the works have been delayed by shortage of labour, owing to the War. The old Chalk Farm station was closed for traffic on May 10th last, and the buildings and platforms have since been removed. The new bridge carrying Regent's Park Road over the railway at Chalk Farm is complete and in use. The bridges and tunnels for the junctions between the new electric lines and the existing lines to Euston and Broad Street are in progress, and the driving of the iron-lined tunnels under Primrose Hill is proceeding steadily, half the length having been completed. The electric power station and repair shed at Stonebridge Park and the six electric sub-stations are complete, and part of the plant has been installed. The carriage sheds at Willesden and Watford are nearing completion. Equipment of the new lines for electric traction between Willesden and Watford is in a forward state.

Further Undertakings.

Electrical equipment of the North London, Hampstead Junction, and North and South Western Junction lines, which form the through route between Broad Street and Kew Bridge and Richmond, is being proceeded with, and the buildings for the sub-stations on these lines are complete. The doubling of a portion of the Coventry and Kenilworth branch has not yet been completed, the men engaged upon it having been transferred to other works of an urgent nature required by the War Office. The down loop at Foleshill was opened for traffic on October 17th last. At Mesty Croft additional

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goods accommodation, consisting of the extension of the goods shed and yard, was brought into use in March last. Reconstruction of the passenger station at Nuneaton is being proceeded with, and portions of the buildings are in use, but the progress of the works has been delayed by shortage of labour and materials. At Marsden additional goods accommodation is being provided, some of which has already been brought into use. Widening of the Chester and Holyhead line between Abergele and Llandulas was opened for passenger traffic on June 27th last. Additional sheds for accommodating the Irish cattle traffic at Holyhead have been completed, and are in use. At the new goods station at Blackwood, on the Sirhowy line, the goods shed has been built, but progress of the remaining works is slow, owing to shortage of men. At various places on the system short branch lines and extensive groups of sidings have been carried out on Government account for the War Office and Ministry of Munitions, and several works of a similar nature are in hand at the present time. The additional goods shed, offices, and other accommodation at Ellesmere Port, on the London and North Western and Great Western Joint Line, are complete and in use. This is the first instalment of a larger scheme.

"Singles" on the Great Western Railway.

Mr. Ahron's articles continue to attract great attention, and further letters evidence the keen interest which they arouse. Mr. L. B. Hewitt, of Bath, writes: "Mr. Ahron's references in the February Railway Magazine to the rebuilding of the 2-2-2 engines on the Great Western Railway as 4-2-2 types recalls a piece of Great Western Railway history. This rebuilding was the sequel to the Box Tunnel accident in 1893, when the 9 a.m. down express from London to Exeter (due at Bath at 11.35 a.m.) ran off the line about half a mile from the west end of the tunnel, fouling the up main line. The engine hauling the express was No. 3021, *Wigmore Castle*, one of the first batch of the 2-2-2 locomotives with 7 ft. 8 in. driving wheels. Almost immediately after the derailed express had come to a standstill, it was run into by the 11.31 up passenger train from Bristol to Chippenham, which had left Bath at 11.30. The up train was hauled by No. 3240 of the 2-4-0 type, built in 1892. Thirteen passengers in the up train were injured. The Board of Trade Inspector (Major-General Hutchinson) said that the cause of the accident to the down train was involved in a good deal of uncertainty. He was disposed to attribute the accident to the right-hand wheels of the engine of the express having mounted the rail while the train was descending the gradient of 1 in 100 in the tunnel at a high rate of speed. The engine had previously bent the line inwards for a length of 78 ft. to the extent of 3 in. There was no superelevation of the rail to resist this tendency to leave the metals."

"The cause of the accident was stated more precisely, and, presumably, with good authority by the Rev. A. H. Malan, in 1894. He remarks that the *Wigmore Castle* collapsed 'at an irregular curve made by itself or by other engines of that class.' At all events, *Wigmore Castle* made her appearance soon afterwards rebuilt with a leading bogie, and 1894 witnessed the advent of No. 3031, *Achilles*, the precursor of the later 50 express engines of the 4-2-2 type. The building of these engines synchronised with the adoption of a lighter shade of green for Great Western locomotives, in place of the olive tint previously employed."

"Another interesting point is raised by Mr. Ahrons in his remarks on page 121 regarding the 0-4-2 tank engines, Nos. 3541 to 3559, and the rebuilding of No. 3560, the last arrival, as a 0-4-4. During the ''nineties,' I frequently saw engines similar to the rebuilt 3560 being hauled 'dead' to Swindon, presumably from the Exeter and Newton Abbot district. From notes made at the time I find that these engines bore the following numbers:—34, 35, 3524, 3533, 3534, 3538, 3540, 3546, 3550, 3556, 3559 and 3560. (Of course this is not a complete or official list.) In the later 'nineties this class was converted to 4-4-0 passenger tender engines, forming a very numerous class. Many have undergone a third modification by the fitting of the Churchward coned boiler. These engines are largely employed on the Salisbury and Bristol services, taking turns with the 2-4-0's on certain trains of an important character. When I saw them as tank engines they were adapted to run on the standard gauge, with outside axle-boxes and cranks for coupling-rods outside the frames."

Reminiscences of Broad Gauge Days: Great Western Railway.

In connection with correspondence elicited by his highly appreciated articles, Mr. Ahrons writes as follows:—"I have no wish, and very little time to enter upon any extended controversy with Mr. Robson upon the subject of the old broad-gauge engines on the B. and E.R. I have already admitted the accuracy of his correction that No. 2001 was the engine in the Bourton accident. My error in the number of the engine was probably derived from the same source as the error in the *Great Western Magazine* mentioned by him. Returning to No. 2004 in the Hele accident, I should have expressed myself on page 229 that part of the train, and not the engine itself, ran off the road. I am quite willing to accept Mr. Robson's statement that some of the 7 ft. 6 in. singles were sent to Newton Abbot after 1887. I might add that there were only about three of these engines at work at that time. But in certain other respects Mr. Robson has given portions of my articles meanings which they do not and cannot be made to bear. I refer to the supposed 'poor impression of the class of man on the footplate 20 years ago.' There were then, just as there exist to-day, 'characters' amongst the men on the footplate, such as may be found amongst all classes of the community,

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Paddington Station Alterations: Great Western Railway.

New 109 ft. Arch on Northern Side of Paddington Station.

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and the 'druid' (who, Mr. Robson may be glad to hear, was not a B. and E. driver at all), was merely an interesting instance. But the fact that there always happen to be a few of these (and they are generally a source of inward joy to me when I come across them) does not in any way affect the character of drivers as a class. Surely Mr. Robson's logic is somewhat at fault here."

"I knew all the broad-gauge Bristol drivers, and perhaps Mr. Robson may admit that there was an average sprinkling of peculiarities amongst even that select band, though no more than are to be found anywhere else. Mr. Robson may, perhaps, remember an elderly individual, whom I will call 'Mr. Inkerman,' while 'Mr. Balaclava' also had some very interesting traits, albeit quite different from the former. On the other hand, one of the Great Western drivers of that day, with whom I fired for some time, was one of the best read men, from a literary point of view, whom I have ever met."

"Mr. Robson's comments on Driver Jones are, moreover, hardly fair, and in no way based upon what I wrote. I knew Mr. Jones well, and I can say that he was a very good engineman, or he could never have succeeded in getting the *Acheron* and a heavy train out of Box Tunnel when engine No. 8 failed. His justifiable views as to the merits of No. 8's performance on that occasion cannot by any stretch of imagination class him as Mr. Robson does."

"Finally, Mr. Robson feels quite sure in his own mind 'that Mr. Ahrons would not get more than "the usual" down Wellington Bank.' Unfortunately for this supposition, I was there on the footplate of the *Lightning* and Mr. Robson was not. And he must also give me credit for knowing not only what was actually accomplished on that occasion, for I have the timing of the run; but also for knowing what was being attempted, and how the engine was being worked."

Glasgow and South Western Railway Locomotives.

Continuing some notes given in our last issue, Mr. Malcolm M. Niven writes:—"About 1901 or early in 1902 a Manson 4–4–0 engine, used on the Greenock route, No. 344, built about 1895, was rebuilt and fitted with one of Mr. Dugald Drummond's water-tube fire-boxes. For a time these were not built up to the tube plate. As a result of experiment it was found that these engines must have the arch built up close to the tube plate to allow the flames and gases to come over the arch and play about the water tubes in the crown of the box."

"Mr. Manson's 4–4–0 engines, beginning with No. 8, were all provided with Stephenson's link motion with valves on top of the cylinders, drive being through a rocker arm and shaft. All his engines were arranged to take steam up to 80 per cent. of the stroke in full gear forward, or to expand from 25 per cent. Mr. Manson's goods engines, however, have valve gear similar to Mr. Smellie's in every respect, the valves being between the cylinders and worked by link motion, the links being *behind* the spectacle plate. The dagger rods worked through a brass bush in the plate."

"Mr. Stirling's valve gear was peculiar. All of his engines were fitted with a swing link, the curved links being in front of the spectacle plate, and the valve rods were suspended by a swinging suspension rod hung from a bracket bolted to the spectacle plate. This valve gear was very economical in fuel, his engines cutting off in full gear at 75 per cent. in fore gear and 71 per cent. in back gear, and doing good work at 20 per cent."

Mr. Niven claims that Mr. Stirling's engines ran dryer and better without domes than the domed engines of to-day and could start away with a full glass of water. Continuing, he states that the steam reversing gears, where used, were fitted on the right hand side of the cabs, but now, as Mr. Peter Drummond places his drivers on the left side, the reversing engine is on the framing outside.

Numbers of Glasgow and South Western Railway Locomotives.

Mr. Niven has supplemented his notes by some useful lists of engines on this line, and we have pleasure in reproducing these. Mr. Stirling's goods engines, 0–4–2 type, built by Neilson and Co., Glasgow, from 1875 on to 1877: Nos. 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249. Nos. 220 to 238 had a wheel and screw to reverse and hand brakes. Mr. Manson rebuilt a number and fitted steam gear and vacuum brakes and added domes.

0–4–2 engines designed by Mr. Stirling and built by Dübs, 1876: Nos. 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269. These engines had steam reversing gear.

0–4–2 engines designed by Mr. Stirling and built by Neilson's about 1879–80: Nos. 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280. These were all similar to the first lot and some have been rebuilt. They were stationed at Glasgow, Dumfries, Carlisle, Girvan, Ayr and Ardrossan, and until about 10 years ago were confined to goods trains, as they were fitted with a hand brake only.

Mr. Stirling's 0–6–0 goods engines built at Kilmarnock, but turned out by Mr. Smellie; early 'eighties: Nos. 12, 13, 16, 17, 41, 43, 45, 46, 47, 48, 49, 50, 51, 52, 159. They were sometimes called the "black goods." All at Ayr or Glasgow. Now mostly either broken up or putting in goods pilot work. Mr. Manson replaced these before he retired.

Mr. Smellie's 0–6–0 goods engines, with diagonal reversing gear, steam brakes; built at Kilmarnock: Nos. 5, 7, 9, 22, 23, 24, 25, 32, 33, 34, 35, 37, 58, 61, 90, 91, 92, 93, 99, 100, 101, 102, 113, 114, 116, 117, 118, 121, 122, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 172,

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173, 174, 175, 176, 177, 178, 179. Those from 160 onwards were sometimes called the "dromedaries." They had large cabs and were the Carlisle goods engines in 1898 and up to 1902. These are really Manson engines, although designed by Mr. Smellie.

Early Manson goods by Dübs, Mr. Manson's first engines, 1892: Nos. 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325.

The Older Passenger Engines.

"Mr. Stirling's 2–4–0 passenger engines, 1874, etc.: Nos. 8, 71, 72, 73, 74, 75, 76, 77, 78, 80; also Nos. 3, 4, 6, 10, 11, 15, 20, 39, 44, 95, 98, 103, 104, 106, 107, 108, 110, 111, 112, 115. These engines all rebuilt now..

"Mr. Smellie's 2–4–0 engines: Nos. 26, 27, 28, 29, 30, 31, 40, 42, 157, 158, 185, 186.

"Mr. Smellie's 4–4–0 engines for the Greenock route: Nos. 119, 120, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 140, 151.

"Mr. Smellie's 6 ft. 9 in. 4–4–0 engines bogies: Nos. 53, 54, 56, 57, 66, 67, 68, 69, 70, 79, 85, 86, 87, 88, 89, 152, 153, 154, 155, 156.

"0–4–4 tank engines, designed by Mr. Stirling but finished by Mr. Smellie: Nos. 1, 2, 21, 38. Only four were built, for the Greenock branch, but owing to small water capacity they were put on the Glasgow and Dalry section and the Potterhill branches.

"Mr. Manson's 0–4–4 tanks built in 1893 by Neilson & Co., Glasgow: Nos. 326, 327, 328, 329, 330, 331, 332, 333, 334, 335. Built for the Springburn and St. Enoch service. Now running to Dalry and Potterhill on the Paisley workmen's trains and on the Renfrew branches.

"Mr. Manson's early Greenock bogies (4–4–0), built by Dübs & Co., 1895: Nos. 336, 337, 338, 339, 340, 341, 342, 343, 344 (Drummond firebox), 345.

"Mr. Manson's later bogies built by Dübs and Co., 1899: Nos. 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360. No. 358 was the engine which went over Inchgreen bank at Greenock in April, 1899. All these engines had balanced slide valves and had dummy spindles as well as the usual rocker gear."

Mr. Niven also refers to a class fitted with a bogie tender in 1893 by Mr. Manson. Nos. 77 and 78 ran principal main line expresses and Nos. 73 and 74 Ayr and Greenock expresses. These bogie tenders were similar to some designed by Mr. Manson when on the Great North of Scotland Railway. About 1897 Nos. 107 and 108 were used and fitted with these tenders, Nos. 189 and 190 being similarly adapted about two years after. Nos. 77, 78, 107, 108 were put on ordinary work with six-wheeled tenders. The bogie tenders are now on Nos. 241 and 242 or similar engines.

Death of Mr. W. S. Laycock.

The death of Mr. W. S. Laycock, founder and head of the well-known firm of manufacturers of railway supplies, is announced. Mr. Laycock was in his 74th year. He belonged to a family which has been engaged in Sheffield trade for three generations. His father, Mr. W. E. Laycock, was a member of the firm of Samuel Laycock & Sons, Ltd., hair-seating manufacturers, Portobello, Sheffield. Mr. W. S. Laycock was his eldest son, and, after receiving his education at the Collegiate School, he entered the family business. He continued to take an active part in it for some time, but in 1884, when he had already passed 40 years of age, he set up on his own account, withdrawing from the management of the old firm, although he still retained a large financial interest in it.

The business which he established—and which is now the company of W. S. Laycock, Ltd.—was that of a manufacturer of railway material, especially internal fittings for carriages, and it developed to such an extent as to necessitate first extensions of the works, then their complete removal to a more commodious site, and further extensions since that time. He achieved his first success with a patent railway carriage window blind, and was a pioneer or inventor of a multitude of clever devices making for safe and luxurious travel, including automatic couplings for carriages and waggons, heating apparatus, carriage window lifts, ventilators, door controllers for waggons, and many other appliances.

At the beginning of the present century, an area at Millhouses was acquired, where the foundation stone of the new Victoria Works was laid on New Year's Day, 1901, by his son, Mr. W. Ernest Laycock. There, amid pleasing country surroundings, the works have continued to grow, and they are now twice as large as they were when opened in 1902. The range of the firm's products has been constantly extended, and the fitting up of Pullman cars became a speciality on the introduction of that luxurious vehicle into this country. One notable achievement was the equipping of "The Southern Belle," the famous train which plies between Victoria Station and Brighton.

The firm employs about 350 workpeople. A few years ago, Mr. Laycock extended his activities by becoming chairman of Cravens, Ltd., Darnall, who build railway carriages (including Pullman cars) and wagons. Mr. Laycock was a member of the Institution of Mechanical Engineers.

Diversion Works on the Dublin and South Eastern Railway.

Discussing the accounts for 1915 at the annual shareholders' meeting, the Chairman, Mr. Frederic W. Pim, mentioned that while cost of working had increased, and the war had brought little additional traffic, at the same time depriving them of a considerable share of their daily suburban passengers, besides the traffic looked for during the tourist and holiday season, these losses would, however, have been to some extent made up for by extra goods and main line passenger traffic, owing to growing agricultural prosperity, had it not been that the

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exposed portions of the coast lines were on three occasions broken through by the sea, necessitating train services being suspended during no less than 35 days in the year. It had long been manifest that the line could be maintained in its actual position only at disproportionate and increasing cost, so that in 1903 Parliamentary powers were obtained for a scheme of diversions which, if promptly carried out, would by this time have removed bodily inland the whole line between Killiney and Bray and between Bray Head and a point near Wicklow. Moreover, had the Company still been in enjoyment of their former revenue from the Kingstown line, there would have been no difficulty in finding the means to carry them out. Circumstanced as they were this was out of the question, but in 1906 it was determined that at least the sections between Killiney and Bray, and between Bray Head and Greystones, must be carried out, and the work was accordingly proceeded with under the powers of an Act obtained in that year. As regards the second division—between Bray Head and Greystones—they had been less fortunate. The section included a tunnel 1,100 yards in length, in the excavation of which engineering difficulties had been met with which had caused considerable delay, and this delay had been greatly aggravated, to the disadvantage of both the contractor and the Company, by scarcity of labour, enhanced cost of materials, and other hindrances arising out of the war conditions of the time, so that about 300 yards still remained unexcavated, and it was as yet impossible to fix a period for the completion of the work. What was now being done was not to rebuild the walls at various points on Bray Head, but to double them, by building against the sea faces a new wall with granite laid in cement, or, where suitable, with concrete.

Effects of the Great Storm of November, 1915.

During the storm of November last more than two miles of the line between Greystones and Newcastle were rendered temporarily unserviceable, and though restoration to a condition of safety was easily effected, it was clear that the only permanently effectual and complete remedy was the diversion inland of the whole section—Greystones to Wicklow. The size and strength of the protective breakwater had been greatly increased, and sand underneath the permanent way was being replaced by a substructure of stone ballast, which should go far to secure the preservation of the line until means could be found for its permanent diversion. The storm of November 12th, 1915, was, in its fury and in its effects, unprecedented in the history of the railway and of Kingstown Harbour. The Harbour Board wind gauge registered the hurricane velocity of 90 miles an hour, and the damage to the East Pier was almost incredible, granite blocks of tons weight being lifted from their seats and bodily shifted considerable distances. On the Dublin and Kingstown section of the railway the sea wall was badly shaken, the coping being for a considerable length thrown down, and in some places the wall broken through, so that the railway was flooded to a depth above the level of the platforms from Booterstown to Salthill. No serious damage was, however, done to the structure of the rampart itself, nor will the cost of restoring the broken wall be extravagantly great.

For 80 years the Dublin and Kingstown section of the line had acted as a rampart for the protection of the public road from Dublin to Kingstown between Merrion and Blackrock, and had enabled the intervening spaces to be reclaimed, to the advantage of the landowners and the urban district. Mr. Pim pointed out that it was a time-honoured British custom that a company which conferred a great public benefit on a district should be heavily mulcted in so-called "compensation" to property owners whom it enriched, and was afterwards taxed for the maintenance of the benefits it had conferred. Thus the Company paid a rate for the maintenance of the public park at Blackrock, the existence of which is due to the railway. Again, for 60 years the Dalkey and Bray and the Greystones and Wicklow sections of the railway have protected thousands of acres of land—part of it from being washed away, and part, if not from actual destruction, at all events from periodical, and, perhaps, from permanent, flooding. That was a duty that properly belonged to the State, and should not fall on a Company which was already, at its own expense, serving a public purpose and conferring a public benefit.

Results on the Great Northern Railway of Ireland.

Mr. Fane Vernon mentioned at the annual meeting that had it not been for the transport of the military, there would have been a shortage of some £4,000 in passenger train receipts. There were 13,867 more first-class passengers, and 77,735 more third-class carried, while the second-class showed a decrease of 24,491. This plainly denoted that the actual increases were due to the carriage of soldiers, who travel altogether in first or third-class carriages. Of the third-class tickets, 5,534 were issued to workmen. In regard to merchandise, there were a number of increases, notably one of 9,300 tons of hay, due to the large purchases made by the military authorities; also 6,800 tons in groceries and bacon, which the prosperity of the people had enabled them to buy more freely, and there were other small increases. On the other hand, timber and building materials continued to decrease in quantity, the reason for which was not far to seek.

The train mileage run had been much less than that of the year before, showing a decrease of 122,568 miles. It was satisfactory to see this decrease running concurrently with increased traffic receipts. This result was largely due to the strict supervision and careful management which had been devoted to the subject, and also to the greatly increased facilities for marshalling trains,

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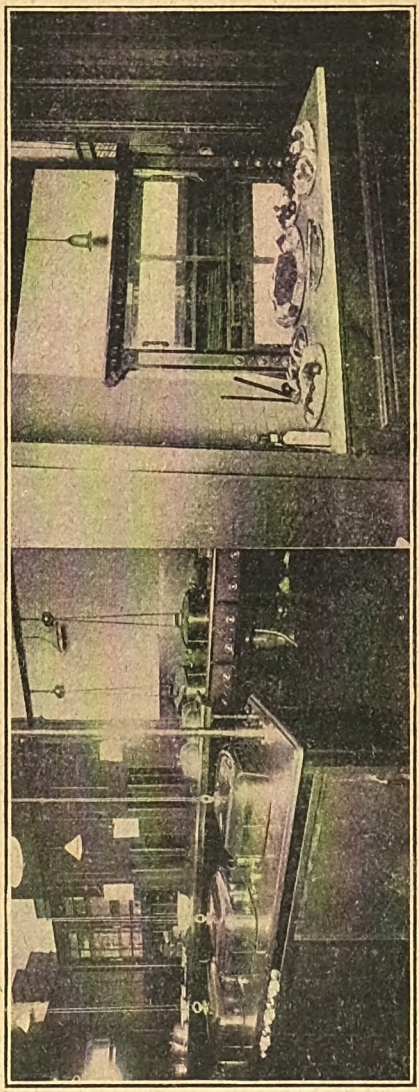
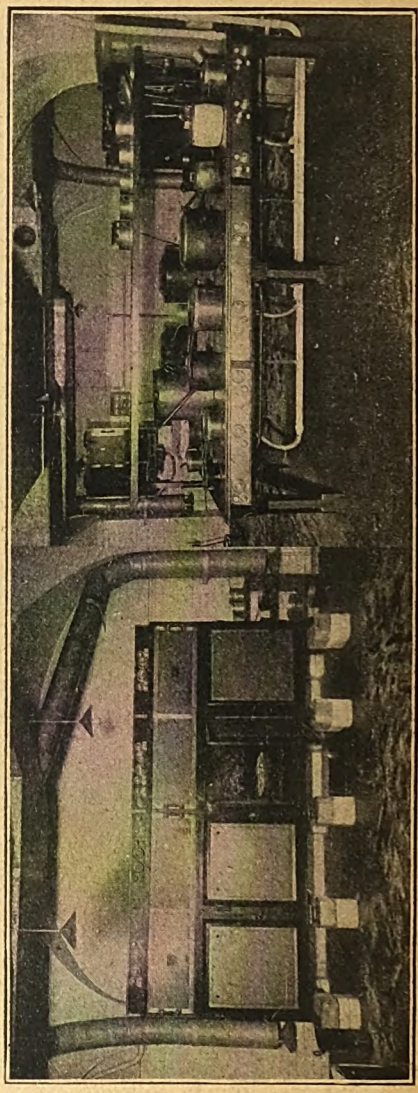
etc., which had been provided at Adelaide, the outlay upon which latter is repaying itself. Three bridges—Crumlin Viaduct, an overline bridge near Enniskillen, and a steel girder aqueduct at Hillsborough—have been renewed. In addition to these, a contract for the reconstruction of Coolkill Viaduct, an old timber structure near Monaghan Road station, has been let, but the new bridge had not yet been erected, as the contractor, owing to the congestion of traffic on the other side of the Channel, had not been able to get his materials through. The same causes had retarded the renewal of the roof over the up and island platforms at Portadown. The cattle depôt at Maysfields had worked very well during the past year, and has enabled the Company to deal with heavy traffic, which would have been quite impossible under old conditions.

Electrical Cooking Apparatus serving the New Dining Rooms at Euston Station, London and North Western Railway.



Electrically-heated Carving Table and Hot Closet and Vegetable Server.

Electrical Silver Grill and Hot Closet.



Electrical Ovens and Hot Closet.

Electrical Boiling Table.

Results from New Locomotives.

FIVE new engines were purchased last year out of revenue and eight on capital account. These were all superheater locomotives, and were giving satisfaction, and effecting a saving in both coal and water. Five new tank locomotives of the superheater type are on order, and should, under normal circumstances, be delivered about Easter next, but their manufacture had not been commenced, as the consent of the Ministry of Munitions had not yet been obtained. These locomotives, had they been delivered, would, during the year, have saved about 1,000 tons of coal as compared with ordinary saturated steam

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locomotives, and the non-delivery was, therefore, all the more to be regretted. Five of the old steam motors have been converted, and are in service as tri-compo brakes, and the remaining two are nearing completion.

Paddington Station Alterations: Great Western Railway.

On the northern side of Paddington station, between the arched covering and the boundary wall, there was a width of 54 ft., consisting of ridge and furrow roofing. In the scheme of alterations now in progress the wall and roofing have been removed, the area thus uncovered coming under the new 109 ft. arch shown in the view reproduced on page 300.

The new bay is designed to agree, as nearly as possible, with the original conception of Brunel. When complete it will be the same length as the existing covering, 700 ft., but in width will exceed the central and largest of the older arches by some 6½ ft. The additional area placed under cover by the new span is about 1⅞ acres, but the full extent of the station widening is not seen from the illustration, since a considerable portion extends under the adjacent roadway.

The arched ribs are of steel, as compared with wrought iron in the former ones, and weigh about 6⅞ tons each. About half the total width of the bay is glazed, the remaining portion being covered with bent sheeting of similar type to that of the old arches. In addition to the "walk" along the ridge of the roof, substantially railed gangways, 3 ft. wide, are provided at the lower extremities of the glazing, affording adequate provision for inspection and cleaning.

The west end is screened with glass similarly to the old work, and the east end is to be specially treated to meet a slight irregularity of shape in the boundary of the railway property. The cast iron columns which supported the old "ridge and furrow" roof have been removed and replaced by strong octagonal steel pillars to meet the increased weight. On the north side the new bay is carried by a series of strong lattice girders, which also support a portion of the roadway adjoining.

The general contractors are Messrs. Holliday and Greenwood, and the sub-contractors for the iron and steel work are the Horseley Company, of Tipton.

Electrical Cooking Apparatus at Euston.

What is considered to be one of the largest electric cooking installations yet in operation in this country or the world is that which has just been put into commission in the kitchen connected with the new dining-rooms (described in our February number) at Euston station. The electric kitchen, in which is prepared the whole of the food used in the restaurant and bar, as well as that needed by the staff, is located in the cellars immediately below the dining-room. The whole of the walls below ground have been faced with white glazed tiles, the floor being tiled in red. There is ample space for the cooking apparatus, for storage, for a commodious larder, as well as for a scullery, pastry department, and the usual accommodation for the chef and kitchen staff.

In the kitchen and vegetable-room downstairs are a four-oven range and hot closet, a twenty-three plate boiling table and *bain-marie*, two ham boilers, grill and hot closet, two self-contained hot closets, and a six-compartment steamer. In the servery upstairs, adjoining the dining-room, are a vegetable server and a large carving table and hot closet, while a double grill with hot cupboard is placed within a recess at one end of the restaurant, in view of the customers.

Every piece of apparatus is metered separately, so that careful tests may be made as to consumption, and a check maintained on waste. The meters are grouped together in a cupboard off the kitchen, where they can readily be got at for periodical reading.

We are indebted to our London and North Western contemporary for the illustrations reproduced on page 304; also for the following additional remarks:—An unusual feature of the new electric kitchen consists of a couple of ham boilers of large size. Each has a capacity of 30 gallons, sufficient for a dozen hams at one time. The equipment in the kitchen includes a large hot closet to hold 1,000 plates. This measures 6 ft. 3 in. by 2 ft. 6 in. by 2 ft. 9 in. high, and is built of cast iron with bright mouldings, the panels being of planished steel. In the vegetable room, which opens out from the kitchen, is a similar but smaller hot closet, measuring 3 ft. 10 in. by 2 ft. by 2 ft. 9 in. high. There is also a circular, six-compartment vegetable and pudding steamer. The compartments are equipped with steam channels and draining holes. Throughout, the steamer is constructed of heavy gauge nickel-plated copper, the compartments being, of course, detachable, any number up to six being used at one time. Two nickel-plated soup tureens are also fitted, each of these measuring 8 in. by 7 in. by 7 in. deep. They are kept hot by means of a water bath.

Two food lifts, electrically driven and operated by push-buttons, permit of cooked food, hot plates, and so forth being sent direct from the kitchen to the servery overhead, telephones being installed for the transmission of orders. The carving-table, which has a hot cupboard below, measures 11 ft. 6 in. by 3 ft. 1 in. by 2 ft. 9 in. high, and is surmounted by a nickel-plated rolled-steel plate, fitted with ornamental moulding all round. The frame is of cast-iron, panelled with planished steel, the sides and doors being double-cased to minimise heat losses. Sliding doors are provided on the near and on the far side, and on the side used by the waiters a 14-in. shelf electrically-heated runs the entire length of the table. This latter feature is quite an innovation, and one that is much appreciated, for it often happens in restaurants that in the interval separating the cutting-off of a portion of meat and its conveyance to table the food

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gets cold. The heated shelf overcomes this disadvantage.

The remaining piece of apparatus is the large silver grill fitted in a recess off the dining-room, close to one of the entrance doors. It is a handsome device, measuring 6 ft. 7 in. high by 5 ft. 2 in. wide by 1 ft. 10 in. deep. Above the grill is a hot closet with sliding doors, while a second hot closet is fitted below the grill. The number of meals provided at present is about 400 per day.

The installation has been supplied by the Brompton and Kensington Accessories Co., Ltd., 254, Earl's Court Road, S.W., under the supervision of the chief electrical engineer, Lt.-Col. Cortez Leigh, T.D.R.E., to the requirements of the Hotel Department.

The St. Bede's Junction Accident.

Lt.-Col. von Donop's report on the serious accident which occurred at St. Bede's Junction, near Jarrow, North Eastern Railway, on December 17th, has unfortunately to be compared with those relating to the Hawes Junction and Aisgill accidents, in that the fire which followed receives special attention. The Inspector considers that three causes jointly contributed to this accident :

(1) The omission to make use on the branch line of the usual code signal to notify the signalman that the train approaching his box was assisted by an engine in the rear. Had this signal been made use of, the signalman at St. Bede's Junction would have known that there was a light engine standing on the up line. For this omission the signalmen concerned are not held responsible, as the signal is not included in the code specially authorised for this branch line. The non-inclusion of this signal in the code appears to be due to the fact that, though assisting engines have been for some time past in regular use on this branch, their use has never been officially authorised. If, as appears to be the case, their use is necessary, it should be duly authorised and the corresponding addition should be made in the signal code.

(2) Want of care on the part of Signalman Hodgson as regards his watching the goods train run through the junction.

(3) The delay in sending the fireman back to the signal-box in accordance with rule 55. The opinion is expressed that no blame appears to attach to the driver of either the up or down train ; each of them was acting rightly in accordance with the signals which he received, and owing to the foggy conditions which obtained at the time, neither of them could have seen the obstruction on the line in front of him in time to prevent the collision. Also that as the signalman knew that the train was frequently assisted up the junction and that no code signal was ever sent to warn him when that was the case, he should have been keeping a careful look-out, and had he been doing so he would readily have seen that there was an assisting engine at the rear of the goods train ; the fact also that the engine was carrying a green tail light, which assisting engines frequently carried, should have at once warned him that that was the case.

In regard to the use of track circuits, Lt.-Col. von Donop points out that their provision would undoubtedly have prevented the accident, as the signalman would have been unable to lower his up home and distant signals whilst the light engine was standing on the up line. The view of the line from the signal box is good, and this was not a case in which the provision of track circuit is urgently called for ; but if, as appears from this instance, light engines are frequently left standing ahead of the cross-over road, its provision would, on that account, appear desirable.

Gas Lighting and Fire Risks.

According to the Inspector the evidence appears to point to the fire having originated with the ignition of a jet of gas which was escaping from one of the gas cylinders of one of the leading vehicles. It is quite possible that the gas may have been ignited in the first instance by some hot cinders or ashes which fell from one of the engines, but it seems certain that it was the gas which was in some way ignited, and not the inflammable portions of the vehicles. The evidence that the fire originated with gas "is more definite than in any previous case, and it furnishes, therefore, a very conclusive object lesson as to the additional danger which is caused in the case of an accident by the presence of gas on the train." It is pointed out that the Board of Trade reports on several previous accidents have included a recommendation that, on the ground of safety, electricity should be adopted for the lighting of trains in preference to gas, and after each of the Hawes Junction, Ditton, and Aisgill accidents the Board specially addressed all railways on the desirability of this being done.

North Eastern Railway representatives stated that during the last three years all new passenger vehicles which have been built have been fitted with electric light, and that all which will be built this year will also be so fitted. From a return it appears that, on December 31st last, out of a total number of 4,241 coaches owned or maintained by the North Eastern Railway, 626 were lighted by electricity. Progress is, therefore being made as regards the fitting of new stock. In regard to recommendations made in Board of Trade reports with the view of rendering gas-lit coaches less liable to danger from fire pending their conversion, it is pointed out that gas cylinders are now being more securely housed, and on 334 coaches incandescent lighting has been introduced, with the result that one gas cylinder suffices for each carriage in lieu of three or four, but the safety valves which have been tried have not been found reliable, and with the exception of the electrically-propelled stock practically nothing has been done as regards the use of non-inflammable material.

The North Eastern Railway has fitted 770 brake vans, out of a total of 836, with rescue and

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fire appliances. These appliances were carried in the brake vans of both the trains concerned in this accident, and were promptly made use of; the extincteurs, principally useful to control the first outbreak of fire, were not found effective, but the tools provided appear to have been of considerable assistance. With a view to preventing telescoping, the headstocks and ends of their coaches are being strengthened, and the buffers made flat instead of convex.

"The Railway Magazine" and the War.

LAST month it was suggested that RAILWAY MAGAZINE readers about to be called to service in His Majesty's Army under the Lord Derby group system should take steps before leaving home to ensure receiving their favourite magazine throughout their military service. We are pleased to learn from many sources that the hint is being acted upon. Readers who are wise in this respect will not suffer the very real deprivation so many did in the early days of the war, through not making proper arrangements on joining the forces. A typical example of those who are taking due precautions is that of Mr. P. F. Cooke, of Openshaw, a long-standing friend of the RAILWAY MAGAZINE. In forwarding photographs for editorial use Mr. Cooke remarks: "As my group is now called up for service they are probably the last I shall be able to send you till the War is over. I hope to be able to see every issue of the RAILWAY MAGAZINE while on service, and have arranged for it to be delivered at my house regularly while I am away." Like all other Derby recruits among our readers Mr. Cooke enters military service with every good wish from the RAILWAY MAGAZINE and the earnest hope that he will safely return at the advent of the coming victorious peace

The S.M.J. Railway and the Shakespeare Tercentenary Commemoration.

As will be seen from our advertisement columns, the Shakespeare Tercentenary Commemoration at Stratford-on-Avon will be held from April 24th to May 6th, under the direction of Mr. F. R. Benson, and a special matinee will be given on May 5th, under Royal patronage when the leading actors and actresses of the day will appear.

In order to afford a permanent souvenir of the Tercentenary of Shakespeare's death, the Governors of the Shakespeare Memorial Theatre have decided to issue a commemoration medal. The medal is reduced in facsimile from a model designed and executed by Dorothy Dick (wife of the Curator and Librarian at the Shakespeare Memorial Theatre), a sculptor whose work in relief has been well known for some years at the Royal Academy, International Society, and other exhibitions.

Coming in the spring of the year, when leafy Warwickshire is looking most beautiful, numerous visitors will naturally be attracted from all parts to enjoy the lovely countryside after the long, dreary and anxious days of the past winter. After the strain of the last year, there must be thousands who will be compelled to take a short respite this year, and there is no place better qualified to produce that feeling of robust health and keen appetite which every holiday-maker should seek than Stratford-on-Avon:

"To those who know thee not, no words can paint,
And those who know thee, know all words are faint."

There are sufficient places of beauty and historical interest in and around Shakespeare's town to provide motor tours for every day in the week. There is a beautifully-situated 9-hole golf course. Then there is the river, and many pleasant hours can be spent on the beautiful Avon. But one might dwell on these aspects, and yet never do justice to the places which must be seen to be realised.

It is understood that the programme now being arranged for the Tercentenary Commemoration is to be of a very attractive character, and we sincerely hope that many of the probable will be converted to the actual seekers after a holiday in the country in these days of strife, when the dangers of the coast occupy so large a portion of our daily newspapers. Full particulars of the Tercentenary Commemorations can be obtained from Miss Alice Rainbow, The Box Office, Stratford-on-Avon, and a beautifully illustrated guide will be sent free on application to Mr. A. E. Diggins, Traffic Manager, Stratford-upon-Avon and Midland Junction Railway, Stratford-on-Avon.

SPECIAL NOTICE.

OWING to the restrictions made by His Majesty's Government on the imports of raw material for paper-making it is urgently recommended that each reader should place a definite order with a newsagent or bookstall manager for The Railway Magazine to be supplied regularly. This will enable the bookselling trade to correctly estimate actual requirements, thus avoiding waste and further ensuring the prompt delivery of the Magazine month by month.

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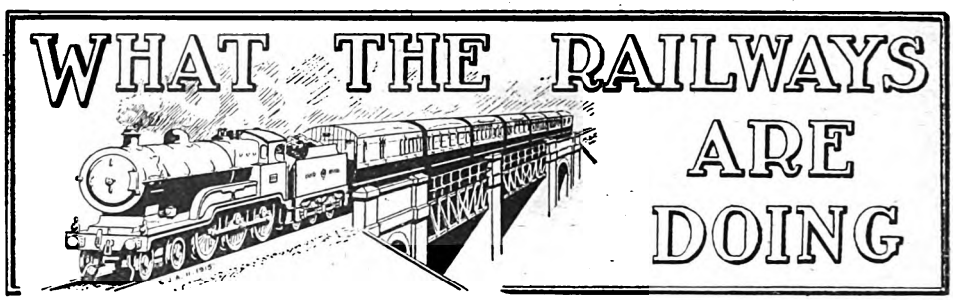

PROGRESS is reported by the Great Western Railway in connection with the construction of the Ealing and Shepherd's Bush Railway, the section of the Wolverhampton and Bridgnorth Railway between Wolverhampton and Kingswinford, the Clydach Pontardawe and Cwmgorse Railway and the Trenance Valley Railway, but, consequent upon the shortage of labour and the difficulty in obtaining materials, the works have proceeded slowly. At Paddington station the additional platforms and lines on the arrival side are nearing completion, and partially in use.

* * *

NEW works completed on the Highland Railway during last year include the following:—A siding for timber traffic at Inchmagranachan, between Dunkeld and Dalguise, and additional sidings for goods traffic at Inverness. Consequent on the requirements of the Admiralty and War Office, sidings have been laid down at Nigg, Invergordon station and harbour, and Dingwall station, and a new passenger platform has been provided at Thurso, under an arrangement with these departments. A block of four houses has been completed at Alves Junction, and a new kitchen and staff accommodation built at the refreshment rooms, Bonar-Bridge station.

* * *

IN the case of the North British Railway a good record of new work has to be credited to 1915. The coal depôt at Dunfermline (Upper) on the south side of the main line is completed and now in use, as also the new engine shed at Galashiels. The whole of the embankment for the doubling of the Harbour Branch in connection with the siding accommodation at Granton has been completed and a start made to the laying down of the permanent way on this portion. The embankment required in the reclamation for the additional sidings is making satisfactory progress. New Goods and Parcel Forwarding Offices at Queen Street are now completed and occupied, and it is hoped the Parcel Receiving Office will, in a short time, be ready for occupation. The work of the steel gangway and hoists connecting these offices with the station is in abeyance owing to the present difficulty in procuring material, but temporary measures have been taken to get the use of the buildings in the meantime. All the works on the Methil No. 3 Dock Contract have now been completed. As reported from time to time, serious trouble has arisen in connection with the working of the dock gates, and the Dock was closed in March, 1915, to allow investigations to be made, with a view to ascertaining the immediate cause of the trouble. These investigations are still proceeding. All the works on the Lothian Lines Contract have been completed, and the lines were opened for traffic on September 30th last.

* * *

CONSTRUCTION of the Hull and Barnsley and Great Central Joint Railway from Gowdall to Braithwell has been seriously impeded by shortage of labour and other causes due to the war, but the line is now nearing completion and will, it is hoped, be ready for opening for merchandise and mineral traffic early in April. This line provides direct access to the Bentley, Bullcroft, and Yorkshire Main Collieries, and joins up with the Great Central, Hull and Barnsley, and Midland joint line at Braithwell, giving access to Thurcroft Colliery, and by means of running powers over a portion of the South Yorkshire Joint Line Committee's railway, to the Dinnington Colliery. Considerable tonnage is already being carried from these collieries to Hull and other places. It is anticipated that the Great Central Railway will make good use of the line.

* * *

THE North British Railway reissued their public time-tables and poster bills for March, consequent on further reductions and alterations in passenger train services. The 10.50 p.m. week-day and Sunday express East Coast trains from Edinburgh, Waverley, to London, King's Cross, leave at 10.20 p.m. Connections from the north and the west to London are also altered, the 9.15 p.m. from Perth leaving at 9.5, and the 9.35 p.m. from Glasgow (Queen Street) leaving at 9.25 p.m. week-days and 9.5 p.m. on Sundays. These latter trains, together with the 7.35 p.m. from Aberdeen are not advertised to call at Edinburgh, though they are necessarily combined there.

* * *

RECENTLY the officers of the Cambrian Railways gave a dinner to the accountant, Mr. W. Finchett, in celebration of the completion of fifty years' service with the Company. Lord Herbert Vane Tempest, a Director of the Company, occupied the chair, and there were also present Mr. S. Williamson (General Manager) Mr. W. K. Minshall (Solicitor), Mr. G. C. Mc-Donald (Engineer), Mr. H. E. Jones (Locomotive Superintendent), and other officers together with Mr. F. Vaughan (Managing Director of the Festiniog Railway). Lord Herbert Vane Tempest,

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on behalf of himself and the Board, congratulated Mr. Finchett, and handed to him a cheque from the Directors as a token of their appreciation of his long and faithful service. Mr. Vaughan and Mr. Williamson also expressed their congratulations to Mr. Finchett, and they were followed by the officers of the Company, all of whom offered their sincere felicitations, and Mr. Finchett suitably responded. A little over two years ago Mr. Goldsworthy (Storekeeper) celebrated his jubilee of service with the Company, and next year the Goods Manager (Mr. W. H. Gough) will complete fifty years' service.

* * *

ADDRESSING the shareholders of the Maryport and Carlisle Railway, Mr. Thomas Hartley stated that, as far as could be ascertained under present conditions, they had carried rather more ordinary passengers in 1915 than in 1913, especially taking into consideration that they had had no excursions or any cheap bookings, and that a good many soldiers and others had travelled free. Although the number of passengers had rather increased the sum received had decreased, probably on account of free travellers. In season tickets there had been a very satisfactory increase—£809 against £681. Mr. Blain, General Manager, attributed this to the increased travelling of scholars to the high-class schools situated on the railway. Local coal had suffered a decrease of 48,000 tons compared with 1913, due to local coal miners turning as much as possible into coke. The total coal and coke carried showed a decrease of 18,000 tons, and there was a decrease in North Eastern coke of 76,000 tons compared with 1913. There had been a considerable traffic in small coal brought to be converted into coke as a set off.

* * *

In general traffic the Maryport and Carlisle Railway had had a very heavy through traffic from the Furness Railway, and from West Cumberland delivered at Linefoot. It had taxed their carrying powers to the utmost, but on the whole it had not caused much inconvenience or disorganised the ordinary traffic. Many passenger trains were not running with quite ordinary regularity, but that depended very much upon the time kept on the main lines. Only one train has been cancelled, the 7.30 p.m. from Carlisle to Wigton, a comparatively new train. This caused a certain inconvenience to passengers who travelled by it, but they were not a very large number.

* * *

THE Board of Trade have recently confirmed the undermentioned order made by the Light Railway Commissioners:—South Yorks Joint Line (Firbeck Light Railway) Order, 1916, authorising the construction of a light railway in the West Riding of the County of York and in the County of Nottingham.

* * *

MR. JOSEPH MARTIN, Goods Superintendent of the Midland Railway (Northern Counties Committee), has retired after 41 years' service with the then Belfast and Northern Counties Railway and its successor, the Midland Railway's Northern Counties Committee.

* * *

ISSUED by the Publicity Department of the London and South Western Railway, a striking poster directs attention to the important work inaugurated last year by Sir Herbert Walker and his staff with the object of developing sugar beet culture in England. Views are given showing crops grown last year in Hampshire, while the poster also epitomises instructions for the various operations necessary. The Company announce that not less than 25s. per ton is offered for 1916 crops by the Anglo-Netherland Sugar Co., with possibility of higher prices according to current price of sugar at the time. The Sugar Co. will also contribute 4s. per ton towards cost of conveyance to their factory at Cantley, Norfolk. Seed is supplied at 5d. per lb., and free advice is given on the spot by experts. For contract forms and further information apply Publicity Department, General Manager's Office, Waterloo station, S.E.

* * *

MR. H. W. THORNTON, General Manager, Great Eastern Railway, who has by invitation been added to the Railway Executive Committee, has also been appointed by the President of the Board of Trade a regular member of that Committee. He has further been elected a member of the Institution of Civil Engineers.

* * *

MR. W. W. HEARD has been appointed Secretary of the Brecon and Merthyr Railway. Mr. Heard entered the service of the Railway Clearing House in August, 1891, where he was on the personal staff of the head of the merchandise department. He joined the Brecon and Merthyr Railway in October, 1893, as clerk in the Secretary's office. In December, 1903, when Mr. Herbert R. Price became General Manager and Secretary, Mr. Heard was appointed Assistant Secretary.

* * *

IN view of our article dealing with the Secretary's Department of the Great Central Railway —see January RAILWAY MAGAZINE—a function which took place at Marylebone station recently is of interest. A presentation was then made to Mr. F. W. Kershaw, who for many years had been on the staff of the Secretary of the Great Central Railway, in the registration department. Mr. W. H. Edge, Chief Clerk to the Secretary, Mr. O. S. Holt, presided.

* * *

INFLUENCES of the war are making themselves apparent in connection with the painting of locomotives. On the Great Western Railway many of the goods and tank engines are appearing in a khaki livery; and on the Great Eastern Railway engines are being turned out in grey. The result in the former case is not unpleasing; while the effect is quite good in the other.

* * *

THE death is announced of Mr. Alexander Rutherford, J.P., for many years Chief Goods

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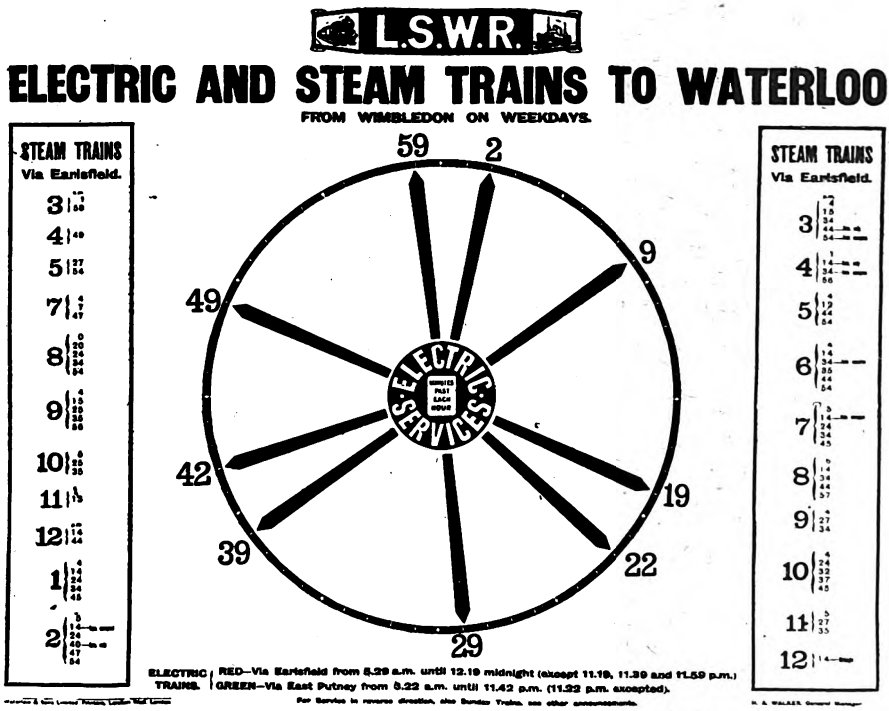
Manager, North British Railway. Mr. Rutherford retired some time ago after fifty-three years' service. He was a J.P. for county Lanark.

* * *

MESSRS. D. NAPIER & SON, LTD., send particulars of work done by their motor lorries, on the basis of a letter from Driver Corner, M.T.A.S.C., who is at present stationed at Malta. He writes: "I enclose in this letter snapshot of a Napier lorry which with many others is doing excellent work out here. The photo" [This will not permit of satisfactory reproduction. ED. R.M.] "shows the lorry in a flood which occurred in the recent severe storm which almost overwhelmed this island. I am very pleased to tell you that these lorries are a marvel in going through such strenuous work. They are working from first thing every morning until last thing at night, and very often all night; I don't know what we should have done without them. The people at home cannot understand the amount of work being done out here, and I am afraid they never will unless they see it with their own eyes. We have 25 of your lorries, and the work they do consists as follows:—Conveying stores all over the island to the different forts and barracks; conveying washing from the hospitals and barracks to laundry; conveying mails from lighters at the wharf to Post Office and storehouses; conveying wounded sitting up cases from the hospital ships to different hospitals; conveying convalescents from the hospitals to the convalescent camps. Every night one Napier lorry is detailed to take the picket to the different places and return and pick them up. They are used for all sorts of odd jobs, and the heavy loads they take along the country roads—mere cart tracks—and the terrible hills they climb, the work they do is marvellous. I must say that they are a very nice car to drive, and it is child's play to change the gears. They require very little attention."



Reproduction of a poster issued by the London and South Western Railway in connection with new electric services. It sets forth all electric trains from Wimbledon to Waterloo on weekdays, the respective routes being indicated by red and green indicators. In view of our article last month and the diagrams then reproduced, this utilisation of the same idea is of interest.

AFTER being several times postponed, electric traction on the Hounslow loop of the London and South Western Railway was inaugurated on Sunday, March 12th. At the same time the new station at Barnes Bridge, on the Surrey side of the Thames, between Barnes and Chiswick stations, was brought into use. The electric trains provide a half-hourly service, and make the "roundabout" journey *viâ* Hounslow and Twickenham so that *viâ* Richmond they fill in the gaps on that section left by the alternate 10 and 20 minute intervals of the Kingston "roundabout" service. *Viâ* Hounslow the new trains leave Waterloo at 22 and 52 minutes past each hour, and serve all stations. The other way

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they leave at 28 and 58 minutes, passing Queen's Road and Wandsworth Town.

* * *

OFFICIALS and employés of the locomotive department of the London, Brighton and South Coast Railway crowded the assembly room at the Imperial Hotel, Queen's Road, Brighton, on a recent Saturday evening, to show their esteem for Mr. J. J. Richardson, M.V.O., who has retired from the position of outdoor locomotive superintendent, having been in the service for forty-eight and a half years. A portrait of Mr. Richardson and brief particulars of his railway career were given in the February RAILWAY MAGAZINE. His colleagues presented him with a handsome adjustable reclining chair, with an elegant oak bureau for Mrs. Richardson. Mr. L. B. Billinton, Locomotive Engineer, presided, and was supported by Mr. R. de Salis (formerly of the London, Brighton and South Coast Railway), Mr. Jackson (Storekeeper), Mr. Cliff (Treasurer's Department), Mr. E. S. Moore (Outdoor Locomotive Superintendent, Mr. Richardson's successor), Mr. A. H. Panter (Carriage Superintendent), Mr. H. P. Dawson (District Locomotive Superintendent, Battersea), Mr. J. Richardson, junr. (Assistant Outdoor Locomotive Superintendent), Mr. W. Jenman (District Locomotive Superintendent), Mr. W. H. Payne (Chief Clerk, Locomotive Department), Mr. B. K. Field (Works Manager), and representatives from Horsham, Eastbourne, New Cross, Battersea, Epsom, Croydon, and other parts of the line.

* * *

AN appeal has been issued in connection with the forty-eighth anniversary collection in aid of the funds of the Railway Benevolent Institution this year. Every effort should be made to prevent this deserving Institution suffering a loss in consequence of the special funds being raised to alleviate distress arising out of the war. Upwards of 140,000 men of all grades in the railway service have voluntarily joined either the Army or the Navy.

* * *

IT is proposed that in order to curtail the consumption of paper and reduce printing and staff costs, the output of time-tables, posters, etc., shall be restricted. It would hardly do to suspend entirely the issue of public time-tables, but it is recommended that only one general public time-table book should be issued by each of the companies, and that the price thereof should be threepence, as against one penny at the present time. The supply of gratuitous copies will probably be suspended entirely. The discontinuance of all forms of local time-tables issued by the various companies is also likely to take place, while the issue of sheet time-tables for posting purposes will be restricted as far as possible.

* * *

IN his speech at the annual meeting of the Underground Electric Railways Company of London, Ltd., Lord George Hamilton stated that before the outbreak of war the companies employed approximately 27,500 men. Of these 7,700 have enlisted and 6,300 attested, representing approximately 50 per cent. of the staff. When all these disturbing elements are taken into consideration it must certainly be admitted that the results show that the companies are worked by a very efficient staff, and the shareholders expressed hearty appreciation of what they are doing to maintain the services and to meet the demands of the Government during the war period.

* * *

MAJOR JOHN A. W. O. TORRENS has been appointed Chairman of the Midland Railway (Northern Counties Committee, Ireland) in succession to the late Rt. Hon. John Young.

* * *

MR. H. BROWNING BUTTON, who has represented the Cambrian Railways in Birmingham and the Midlands for many years, is temporarily leaving the railway service to take up an appointment under the Ministry of Munitions.

* * *

SOME time ago the Underground Railways exhibited in their cars a series of photographs of places of interest in and around London. This scheme has since been greatly extended, so that Kodak photographs now form part of the permanent decorations. The practice is to take a place served by the Underground system, and make known to the public the actual attractions of the place by means of an excellent enlarged photograph, the original Kodak snapshot being also shown. Thus one series is known as "The way to the sights of London," and shows not only historic buildings, but the familiar figures of the every-day life of the streets. It is a known fact that very few people have a really intimate knowledge of London, and many who have once explored its quaint by-ways and odd corners will want to make some record of their wanderings. A further series deals with those parts of London's countryside which are within easy access by rail, 'bus, or tram. All the photographs are excellently produced on bromide paper, and are neither too detailed nor do they lose the clearness of their outline in an attempt to imitate pencil or brush-work. The latest ones in the District cars are framed in the setting of a mahogany panel, which suits them admirably. A fine specimen showing a view in Staple Inn has been submitted to us.

* * *

ADDITIONAL 4-6-0 passenger engines ("Prince of Wales" class) will shortly be turned out from Crewe Works, London and North Western Railway:—Nos. 810 *Onyx*, 1084 *Shark*, 1346 *Trent*, 2417 *Atlas*, and 2442 *Odin*. These engines complete the series referred to in the March issue of the RAILWAY MAGAZINE. Of the twenty similar engines ordered from the North British Locomotive Co., Ltd., the two first arrived in Crewe on March 8th. No. 1930 *Ramillies*, one of the two Belpaire "Jubilee" compounds, is being converted to simple with two inside cylinders 18½ in. by 24 in. diameter. Recent withdrawals from service include No. 1217

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Florence (a 6 ft. 6 in. "Jumbo"), No. 1167 (a 4 ft. 6 in. passenger tank), No. 745 (6 w.c. coal) and No. 170 (5 ft. compound goods). To the list of stations of 4–6–0 engines of the latest "patriotic" series, given in the March RAILWAY MAGAZINE, may be added the following, which complete the list:—Nos. 27 *General Joffre*, 1333 *Sir John French*, 2408 *Admiral Jellicoe*, at Crewe; No. 122 *King of the Belgians*, at Chester; No. 185 *King of Italy*, at Edge Hill (Liverpool); and No. 2396 *Queen of the Belgians*, at Rugby. In the list given on page 238, No. 877 should be *Raymond Poincare*, not as there printed.

* * *

THE fifth annual Exhibition of the Model Railway Club will be held at the College of Ambulance, Vere Street, Oxford Street, on Wednesday, Thursday and Friday, April 26th, 27th and 28th, from 3 to 10 p.m. each day. The Committee hope, by means of this exhibition, to raise funds to help to provide the College with a motor ambulance to convey wounded soldiers from London to a convalescent home in the country. Besides an exhibition of models, there will be locomotives running on the tracks and competitions of various kinds for steam and clockwork locomotives and prizes will be offered. Admission on Wednesday from 3 to 6 will be 5s., while for the remainder of the time the charge will be 1s. Tickets and particulars of the competitions, etc., which are open to all, can be obtained from the Honorary Secretary, Mr. T. W. Pitt, 111, Rosebery Avenue, Manor Park, London, E.

* * *

EARLY experience augurs well for the efficient working of the new London General Omnibus Company's female conductors. The first 80 of these "conductorettes" will be rapidly followed by another 250, and the number in training is being added to daily. The uniform consists of dark blue Norfolk jacket with white piping, short plain skirt reaching three inches below the knee, alpine hat turned up at the side with a "General" badge in front, leather and cloth gaiters reaching to the knee. The female conductors work the same hours and receive the same pay as the male conductors whose places owing to the War they have filled. Special arrangements have been made for their training at the Company's Training School at Chelsea, where they have received thorough instruction in the use of the punch and tickets, the giving of change and a knowledge of the geographical districts on the routes they will serve. Special catering arrangements and lavatory accommodation has been provided for at the garages and terminal points. At the Training School the first 300 female conductors had a musical send-off at which they provided their own programme.

Railway Literature.

THE RAILWAY YEAR BOOK, 1916. [The Railway Publishing Co., Ltd., 30, Fetter Lane, Fleet Street, London, E.C.]

A preliminary announcement was given last month, and now that this invaluable annual is published, further reference may be made. Notwithstanding the fact that the British Empire and its Allies are still engaged in a world-wide war, it is felt that a reference work of such great importance as the "Railway Year Book" is none the less needed, and so for the nineteenth successive year a new edition is offered to the large and appreciative public who find the book of immense service in the pursuit of their businesses, studies or avocations. The extent to which the "Railway Year Book" is used by officers in His Majesty's Army demonstrates its usefulness in a sphere not generally realised by many of its annual subscribers in railway, engineering and commercial circles.

In this new edition all the various features of proved utility in other years have been retained, having been duly corrected and brought up to date, as is necessary by reason of the constant change that takes place in railway affairs. Many alterations may appear minor matters in themselves, but, taken in the aggregate, they involve considerable correction year by year. Much of the statistical data given cannot be obtained elsewhere in the form herein presented, and very little of it is otherwise available save at the expenditure of considerable time, labour and pecuniary outlay.

Information concerning British railway arrangements with the State, the *personnel* of the British Railway Executive Committee, numbers of railway men serving in the armed forces of the Crown, and particulars of ambulance trains equipped by British railways, are of peculiar interest at the moment and will be of great historical value in the days to come.

Much of the material in the Historical Sketches has been improved by the introduction of new facts and additional information, while the statistics relating to each railway are as full as the particular circumstances of the present times will permit. New tables introduced last year have been retained, improved upon and brought up to date, while a further one relating to railway-owned steamers is added.

In an age when the personal note is of extreme value and railway transport questions are so much to the fore, the railway officers' "Who's Who" in the "Railway Year Book" is in constant use in newspaper, government and other offices. This section of the current book has been enriched by the introduction of many additional biographies of leading railway men, while the old ones have been revised, the whole being re-set in a new and very readable type.

In spite of the increased cost of production the price remains 2s. 6d. net, as in previous years. Postage in the British Isles is 5d. per copy; abroad, 8d.

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THE RAILWAY MAGAZINE.

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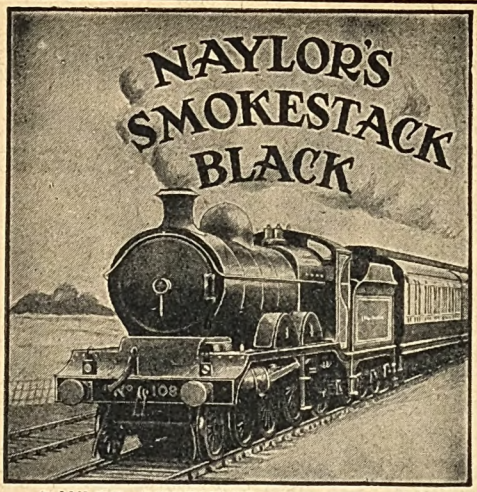

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413.	Up Liverpool	"Edward Tootal."
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Photo] [*R. C. Carter.*

CANADIAN PACIFIC RAILWAY.

Southbound "Soo Line" Express near Winnipeg.
4-6-2 locomotive No. 2649.

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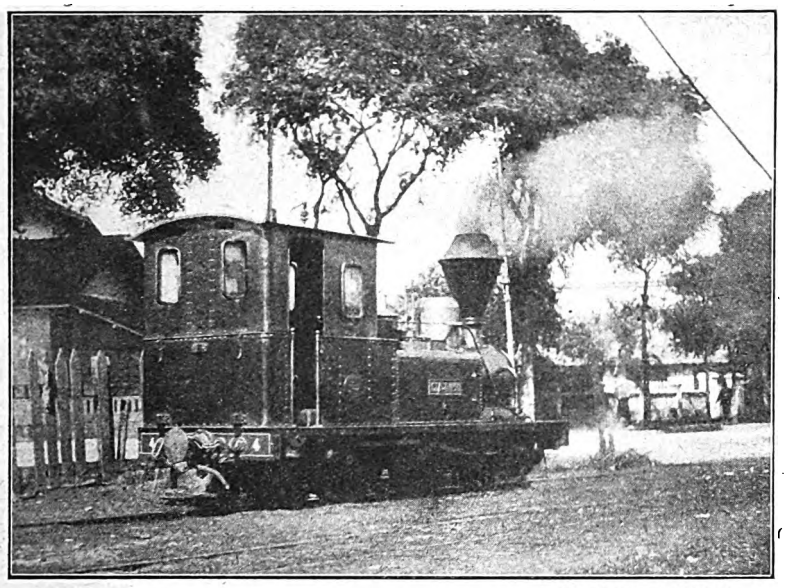

Photo] [*Major F. S. Watson.*

INDO-CHINA RAILWAYS.

2-4-0 tank engine, Saigon-Cholon Tramway.

Railways in the Far East.

By MAJOR F. S. WATSON, R.G.A.

THE following notes and impressions of certain railways encountered while travelling from Singapore to Japan are merely observations made during a limited stay at each place and, of course, give only the outside aspect of the various lines, though every effort has been made to ensure accuracy.

Indo-China Railways.

These lines are under the French Colonial Government and are, at present, rather incomplete, though a fairly comprehensive programme has been suggested and will, no doubt, be carried out as funds permit. Saigon, the Capital, is in the south, situated on a network of rivers, and not far away to the west is the big Mekong River with its delta. For this reason, most of the transport in this district being by water, railways have been considered as more or less of a luxury, though a line has been built from Saigon, past the busy manufacturing suburb of Cholon, to Mytho, on the Mekong delta, about 44 miles away. To the east a line runs along the coast to Phan Rang, some 120 miles, and the idea is to continue this all the way to Hanoi, the Capital of Tonkin, in the north-east, a distance of about a thousand miles. Of this, there is a short section northwards from Tourane to beyond Hué completed, as well as the last portion from Vinh to Hanoi. From Hanoi three other lines are in existence, one eastwards to the port of Haiphong, at the mouth of the Delta of the Fleuve Rouge; another to Dong Dang, just beyond Langson on the Chinese Border to the north-east; and the third in a north-westerly direction up the valley of the Fleuve Rouge to Yunnan Fu in China, a distance of about three hundred miles, thus forming an outlet for the trade of the large Chinese Province of Yunnan. This line to Yunnan is worked by the Yunnan Railway Company, and is taken through some very difficult country after entering China. It is said to be a wonderful engineering triumph for the French engineers who built it.

At Saigon, then, the only railways at present in use are those to Phan Rang and Mytho, though there is a "tramway" to Cholon (on the Mytho line) of the same gauge (one metre) as the other lines, and using the oldest rolling stock—diminutive tank engines and four-wheeled carriages. On the Mytho line small tank engines are also used, but for the "expresses" eight-wheeled passenger stock is employed. The

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"expresses" take 2 hours for the 44 miles, against the ordinary train's 3 hours. This line is dead level the whole way, except where it climbs up on to a bridge to cross the rivers which intersect the low-lying rice fields. A very primitive means of signalling is employed at passing places. A man plants a red flag in the permanent way to show that no train may pass. When the train may proceed, the red flag is picked up and a green one waved—a simple method, but no doubt sufficiently effective as the speed does not average much above 20 miles per hour and usually less.

The chief locomotives employed are :—

(1) A 4–6–0 type of tender engine built at Cail.

(2) A 2–6–2 type of tender engine built by the Societé Franco Belge.

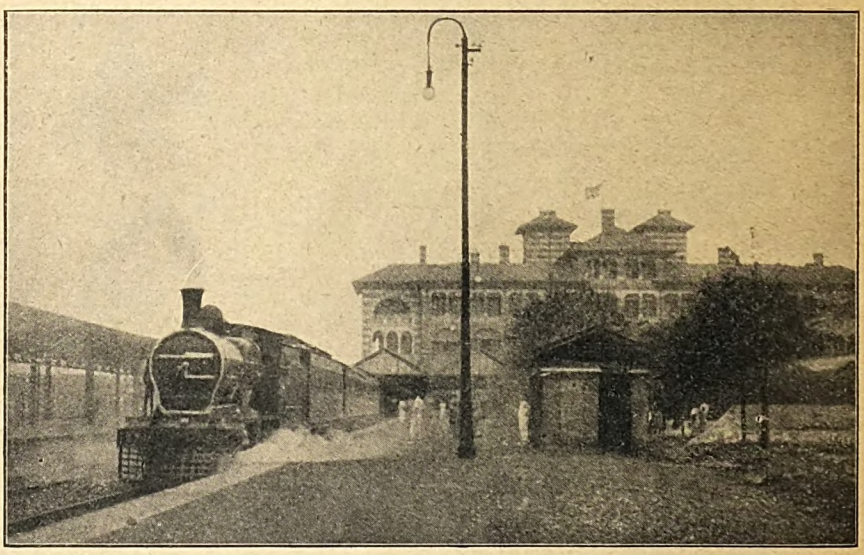
(3) An old 4–4–0 type apparently used for shunting, built by the same firm.

(4) Various tank engines, 4–4–0, 0–6–0, 2–4–0, the last type being used on the Cholon Tramway.

The present Saigon terminus is a rather primitive affair, with a single platform. It is not far from the river and wharves, but a new station is being built about half-a-mile or more inland. This will have three platforms, accommodating four pairs of rails, two bays and a goods shed.

Various lines have been projected in addition to the coast line to Hanoi. Two of these were to link up the Indo-China lines with those of Siam; one to start from Saigon *viâ* Pnom Penh and Battambang to Bangkok; and the other across country from Hué. If these were completed they would form part of an extensive scheme of railways, as the Siamese lines should be connected with those of the Federated Malay States before many years have passed, and the joining of these with the railways in Burma and India is only a matter of time —made longer, unfortunately, by the present war.

In the north, more properly in China, railways are projected from Yunnan Fu to Singyifu and Nanking. This line will be built by the French, while an English firm is to make a line connecting therewith at Singyifu, to Hankow, where it will join the main Chinese railway system, a distance of about six hundred miles. It has also been proposed to connect the Province of Yunnan by railway with Burma, though the engineering difficulties would be very great.



Photo] [*Major F. S. Watson.*

SHANGHAI–NANKING RAILWAY.

4–2–2 engine *Chin Kiang* on train at Shanghai.

Some Chinese Railways.

At Kowloon, opposite Hong Kong, one comes across the Canton-Kowloon Railway. This line, as its name implies, runs from Canton, an important city in South China, to Kowloon, in British territory on the mainland opposite Victoria, the chief town on the island of Hong Kong, to which it is

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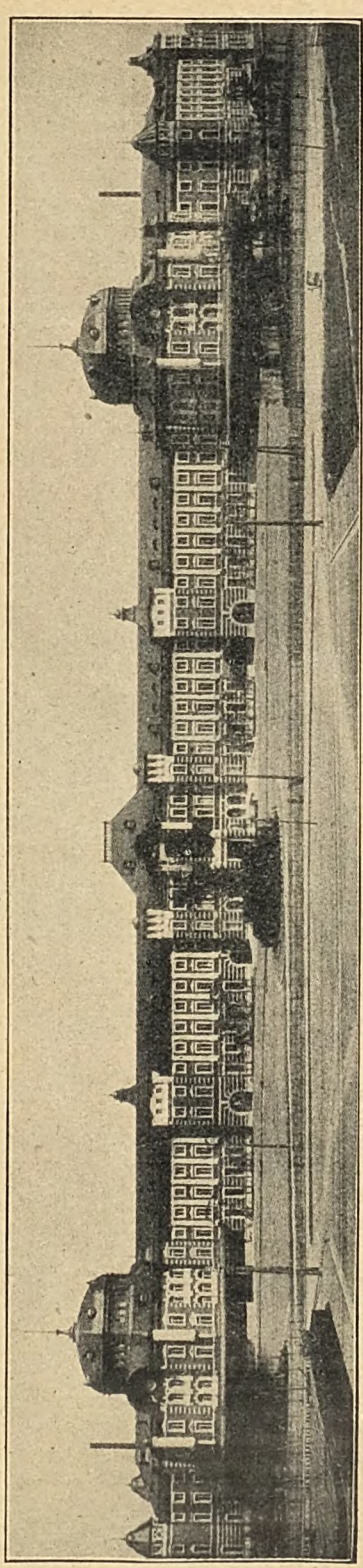
connected by a steam ferry. The railway is built on a 4 ft. 8½ in. gauge (the standard gauge of China) and is under dual control, the part of the line in China being run by the Chinese and the rest by the British. The length of the main line is one hundred and eleven miles and there are four through trains each way daily, three of them being expresses, and one a stopping train. The express trains take about 3½ hours for the journey, the down slow train 7¾ hours, the up slow 6¾ hours. Besides these there are a few local trains in the various sections, more especially the Kowloon end. There was not much opportunity of inspecting the rolling stock, but some up-to-date 2–6–4 tank engines by Kitson, of Leeds, were seen, as well as comfortable looking and roomy eight-wheeled carriages. It is proposed to make a line from Canton to Hankow to connect with the North China Railways.

At Shanghai there are two railways: the Shanghai-Nanking line and the Shanghai-Hangchow-Ningpo Railway. The Shanghai-Nanking Railway extends to Nanking, 193 miles long, with a branch, or rather a continuation, down the Whangpoo River to Woosung on the Yang Tse Estuary, about 12 miles distant. This latter line is the successor to one of the first Chinese railways, built on a gauge of 2 ft. 6 in.; but it had to be discontinued owing to the hostility of the Chinese at the time. It is now, of course, 4 ft. 8½ in. gauge.

The country for miles round Shanghai is very flat, and so railway construction should not be difficult. As far as Soochow, 53 miles, the gradients are therefore easy, but beyond this they are harder. The chief locomotive types employed are 4–2–2, 4–4–2 and 4–4–0 tender engines and 2–6–2 and 2–4–2 tank engines. Most of them were built by Kerr Stuart & Co., of London and Stoke. The carriages are chiefly eight-wheelers, and 1st class are very comfortable; all have centre couplings and buffers combined. The line is single and at Nanking connects by ferry with the railway to Tientsin and Peking. From Tientsin the Manchurian lines can be reached, and these again connect with the Trans-Siberian Railway and Europe.

The best train takes five hours fifty-five minutes to run to Nanking, thus averaging nearly 33 miles per hour, and there is one day and one night express each way; the night trains take eight hours for the journey. Two other through trains are run and a few local ones. The Shanghai station consists of



THE NEW TOKYO STATION: JAPANESE STATE RAILWAYS.

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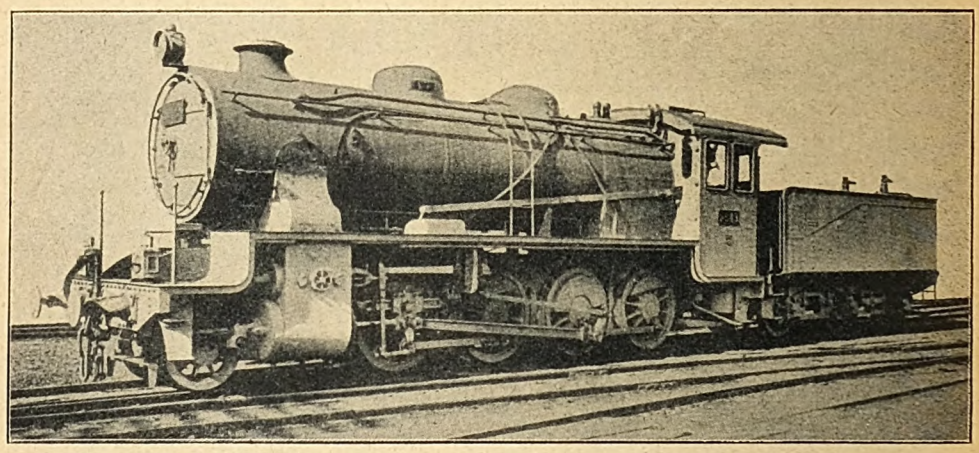
a long platform with a bay at each end and a large block of offices.

The Shanghai - Hangchow - Ningpo line (formerly the Kiang-su Railway) runs from a separate station in Shanghai to Hangchow and Ningpo, two treaty ports to the south. The rolling stock is very similar to that of the Shanghai-Nanking line with the exception of some of the carriages, which are American built, and the locomotives, which are of various types and only a few of each. Among these are some 2-6-0 engines built in America, two 4-4-0 classes of tender engines, 0-8-0 and 0-6-0 tank engines built in Germany, and a 4-4-0 class by Kerr Stuart & Co., of England. Both the above lines are under British management.

Japanese Railways.

One's first impression of a Japanese railway is that of an English railway system on a small scale. Similar station buildings, with booking offices, etc., as at home. The platforms are raised level with the footboards; similar semaphore signals are in use. Most of the goods trucks have only four wheels; the rolling stock has side buffers; level crossings are avoided where possible; all these small points remind one of British railways, and it is chiefly the engines and passenger carriages that differ. The locomotives are of many types, chiefly American and German, though some British ones exist and the Japanese are building their own now to a great extent. The carriages are usually 8 or 12-wheelers, and have a narrow horizontal panel coloured differently for the respective classes. White for first, blue for second, and red for third. There is a passage down the centre, and a long seat on either side, as in a 'bus; this gives one a view out of the windows on the opposite side, and not on one's own side without craning one's neck round or kneeling on the seat. The carriages are, however, very easy running.

It was in the early 'seventies that railways were introduced into Japan, the first being those between Tokyo and Yokohama, and Kyoto to Osaka and Kobe. These were quickly followed by others until now there is a railway from Tokyo to Aomori in the north, connecting by steamer with Hakodati and the lines in Hokkaido, the Northern Island. There is another one from Tokyo to Shimonoseki, on the Straits of the same name, where there is a ferry service to Moji just opposite, on the Island of Kiushiu. From Moji the railway runs to Nagasaki and Kagoshima. The line south-westwards of Tokyo is called the "Tokaido" Railway, as it follows, in the main, the route of the old "Tokaido" road, which was the ancient highway into Tokyo, or Yedo as it was then called. Besides these lines there are other secondary main lines more or less parallel to the above with many cross-country connections. All the chief lines are under Government control, and the private ones are very few and far between. All are 3 ft. 6 in. gauge, though it has been lately proposed to convert them into broad gauge lines, and a committee has been recently appointed to investigate the matter.



2-8-0 SUPERHEATER ENGINE: JAPANESE STATE RAILWAYS.

As Japan is a very mountainous country, railway construction has been none too easy, and even on the main lines there are gradients as steep as one in forty, as, for instance, the

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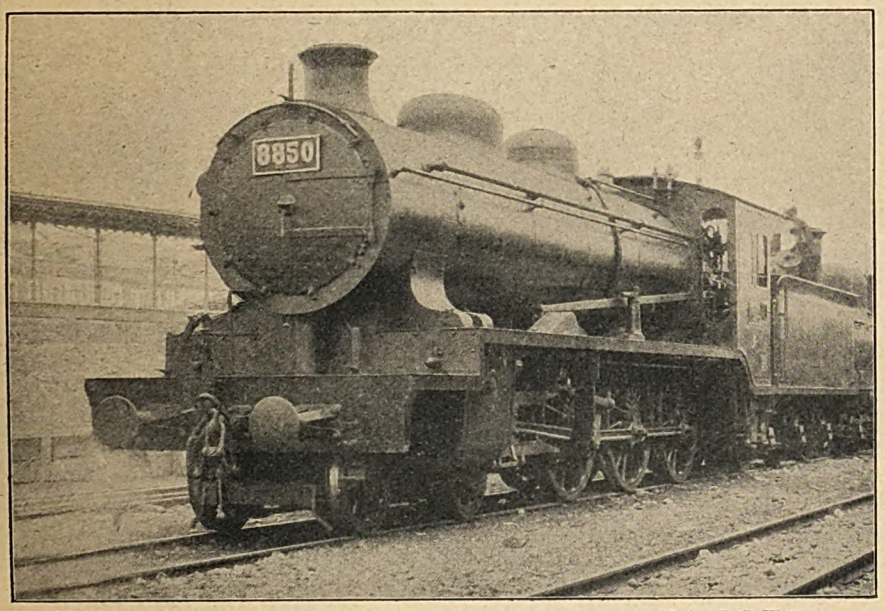
climb over the high ground between Fuji and the Hakone Mountains, about fifteen hundred feet from almost sea level on either side. Gotemba at the summit is twenty-two miles from Kodzu on the one side and fifteen from Numadzu on the other. Here an American 0–6–6–0 tender engine is used pushing behind.

This, of course, tends to keep the speeds down, but they are never very high and seldom average more than 36 miles an hour start to stop, or much over 40 for short distances. On the hilly sections the speed is usually between 15 and 20 miles per hour, but a second engine is often employed here, pushing behind.

of engine in Japan and is seen everywhere on short distance light express and stopping trains. They have outside inclined cylinders with a small low-pitched boiler and are fairly old. They are of various makes, but chiefly British and German.

Various tank engines are also met with, and an old British built 4–4–0 (Neilson, Reid & Co. series), but they are not very common and are used principally for shunting.

Besides these there are 2–8–0 goods engines, a 4–6–0 British built type ("8700" class) used in the Tokyo district, and very similar to the "8850" class, but with a smaller boiler; also American and Japanese 2–6–0 goods engines.



Photo] [*Major F. S. Watson.*

4–6–0 ENGINE NO. 8850: JAPANESE STATE RAILWAYS.

The principal types of engines used on the main line between Kobe and Tokyo are:—

For express work between Kobe and Nagoya a 4–6–2 American superheater type ("8900" class); beyond Nagoya the "8850" class, a German 4–6–0, is used. Another German class of 4–6–0 engines ("8800" class) is used in the Kobe district for express work as well; these are very ugly engines, the bogie centre being well behind the smokebox.

Other passenger engines are 4–4–0 American and Japanese types, for lighter passenger work, and a small type of 4–4–0 engine, which is by far the commonest class

On the Northern line one sees the small 4–4–0 class mentioned above, and occasionally an American built "Atlantic"; but the express work is done chiefly by larger 4–4–0 engines built in Japan. Besides these there are, of course, various types of goods and shunting engines, including some 2–4–2 American tank engines.

Japanese stations are arranged much like those at home with booking offices, waiting and refreshment rooms, etc. English being the recognised language for foreigners in Japan, the tickets between the principal stations on the main lines are printed in English on one side and Japanese on the other, and the names of stations and

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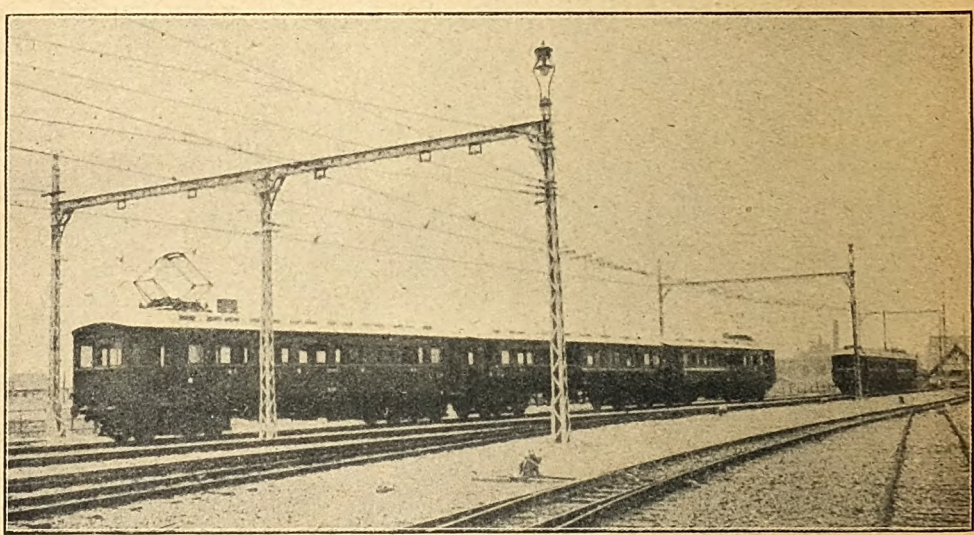
important notices are also in English. Passengers' luggage is dealt with as follows :—The luggage is weighed, free allowance deducted and the remainder, if any, paid for. The passenger has a paper given him which he delivers up at the far end and obtains his luggage, which he has no need to think about at all during the journey. It is, however, as well to reach the station some ten minutes before the train starts, or one may find that he has caught the train, but the luggage hasn't.

Dining cars, with European as well as Japanese meals, are found on all the principal express trains; Japanese food is also served in dining cars on trains of less importance. Sleeping cars, also, are provided on the principal long-distance night trains. Four through trains are run in the twenty-four hours from Tokyo to Shimonoseki and *vice versâ*, the fastest taking 25 hours 38 min. for the 705¾ miles, or about 27·6 miles per hour, including stops. On the Northern line there are three through trains to Aomori daily, the distance of 457 miles being done in 17¼ hours, or 27·3 miles an hour.

Tokyo, the capital, possesses five railway termini, four of which belong to the Government lines, and the fifth, Asakusa in the east, belongs to a small private railway running for about one hundred miles in a northerly direction. The old station for the the Tokaido Railway was at Shimbashi in the south of the city and was a terminus on the ordinary ground level. The terminus for the Northern line is at Ueno, in the north of Tokyo, near Ueno Park. The other stations are, Manseibashi, with lines running to the west; and Ryogokubashi, with chiefly local lines running east. A few years ago it was decided to build a new central station to take the place of the Shimbashi terminus, and this was completed in 1914. The approaches to this station are elevated and consist of four tracks, two for steam trains and two for electric. The station itself is elevated, the buildings being on the western side, all very large and roomy, the approaches to the platforms being by subways. There are four island platforms, one each being allotted for electric train arrivals and departures, and one each for steam train arrivals and departures. To the east, below the station on the ground level, are engine and carriage sheds; the goods depôt being at the old Shimbashi terminus, now closed for passenger traffic.



ELECTRIC TRAIN NEAR TOKYO: JAPANESE STATE RAILWAYS.

It is proposed, in time, to connect the principal termini with the new central station, but it will be a large undertaking, as all the approach lines will have to be on embankments or viaducts through the city. In addition to the ordinary steam lines there are various electric railways in the neighbourhood of Tokyo, among which are a line to Yokohama and a belt line round the northern and western outskirts of the city, from the central station to Ueno.

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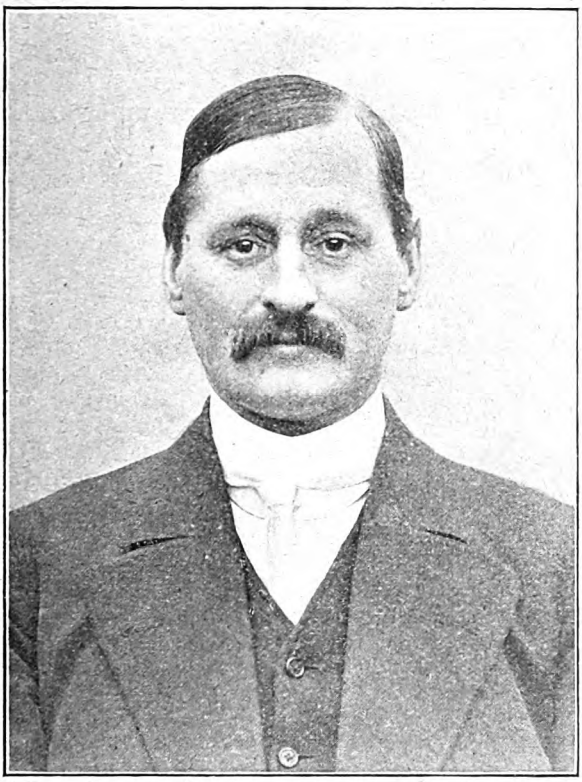
THE RAILWAY PORTRAIT GALLERY.



MR. W. W. H. WARNEFORD.

Wagon Superintendent, London and North Western Railway.

MR. WARNEFORD is the youngest son of the late Canon Warneford, M.A., of Warneford Court, Wilts. He was educated at Newark Grammar School and St. Mark's, Windsor, and commenced his apprenticeship at the Lancashire and Yorkshire Works, Miles Platting. In 1883 he left to go to the London and North Western Railway works at Crewe as a premium apprentice. He then became a private pupil under Mr. F. W. Webb for four years. In March, 1889, he was appointed Assistant Manager, and was placed at the manufacturing end of the works, having under his charge the Bessemer plant, Siemens-Martin melting furnaces, rolling mills, forges, foundries, contract work and gas works, which position he held for 21 years. On Mr. A. R. Trevithick's appointment as Superintendent of the wagon works at Earlestown, in 1910, Mr. Warneford was made Works Manager at Crewe, and he again follows Mr. Trevithick, who is now Carriage Superintendent at Wolverton in succession to Mr. H. D. Earl, retired. Mr. Warneford was one of the first officers of the Crewe Railway Engineer Corps, formed in 1887, and retired with the honorary rank of Major.

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The York and North Midland Railway.

By H. H. MEIK.

THE North Eastern Railway was incorporated by Act dated July 31st, 1854, by the amalgamation of (1) The York and North Midland Railway; (2) the Leeds Northern Railway; (3) the Malton and Driffield Railway; and (4) the York, Newcastle and Berwick Railway. In this article it is proposed to deal with the York and North Midland Railway from its inception to the date of its amalgamation in 1854.

During the years 1832–3 a Railway Committee of the Corporation of York had been considering various plans for constructing a line from that city to join one of the numerous projected lines from the south and west. In the course of their deliberations, a great deal of talk was caused by a young linen draper in York, called George Hudson, putting his name down for a large amount of shares in a scheme to connect the city with the West Riding, which he favoured in preference to a scheme for a line to the south in the direction of Doncaster.

Among the schemes proposed was one *viâ* Tadcaster and Aberford to Garforth, and another *viâ* Bolton Percy to Milford, where it was to join the Leeds and Selby Railway. The Committee afterwards became of the opinion that the line should connect with the Leeds and Selby Railway at both Garforth and Milford.

During the year 1835 George Hudson paid a visit to Whitby, where he met George Stephenson, who at that time was surveying lines between Birmingham, Derby and Leeds, and from him Hudson heard of the different schemes that were then being projected to connect London and Leeds.

As a result of this meeting, a meeting of the inhabitants of York and the neighbourhood was held in October, 1835, when the York and North Midland Railway was formed with a capital of £200,000; George Hudson being appointed Chairman, and George Stephenson Engineer. A Provisional Committee was formed, and the two routes above mentioned were submitted to them and the one *viâ* Bolton Percy was chosen, Stephenson being instructed to proceed with the survey. The line, as finally approved of, started at Tanner Row, York, and running *viâ* Milford, Burton Salmon and Castleford, joined the North Midland Railway at Altofts Junction, 72 chains north of Normanton station. The promoters, in due course, lodged a Bill in Parliament, which received Royal Assent as "The York and North Midland Railway" Act on June 21st, 1836 (6 and 7 Will. IV. c. 81).

The length of the main line was 23 miles 41 chains. There were also three short branches, viz.: (1) From Sherburn to York Junction (now called Gascoigne Wood Junction), on the Leeds and Selby Railway, a distance of 1 mile 16 chains; (2) from a point now known as Milford Junction to York Junction, a distance of 1 mile 7 chains; and (3) from a point now called Whitwood Junction (1 mile 4 chains west of Castleford) to a junction with the North Midland Railway, 74 chains south of Methley station, a distance of 1 mile 8 chains. These branches, together with the main line, made a total distance of 26 miles 72 chains, as at present shown on the Railway Clearing House Map.* The original capital of the company was £370,000, with borrowing powers to the extent of £123,333; but by an amendment Act passed June 30th, 1837, the capital was reduced to £335,000 and the borrowing powers to £111,666.

At the half-yearly meeting held on July 18th, 1836, it was stated that with exception of two acres, the whole of the line for the 14½ miles from York to the York Junction had been purchased, the acreage being 168, and the total cost £12,388, while £5,000 had been paid as compensation for dividing an estate. All the purchases had been effected without recourse to a jury.

With the object of extending the scope of their line, the Company entered into schemes

* These distances are reckoned from the present York station. The distance from the original York and North Midland station within the walls was a few chains longer.

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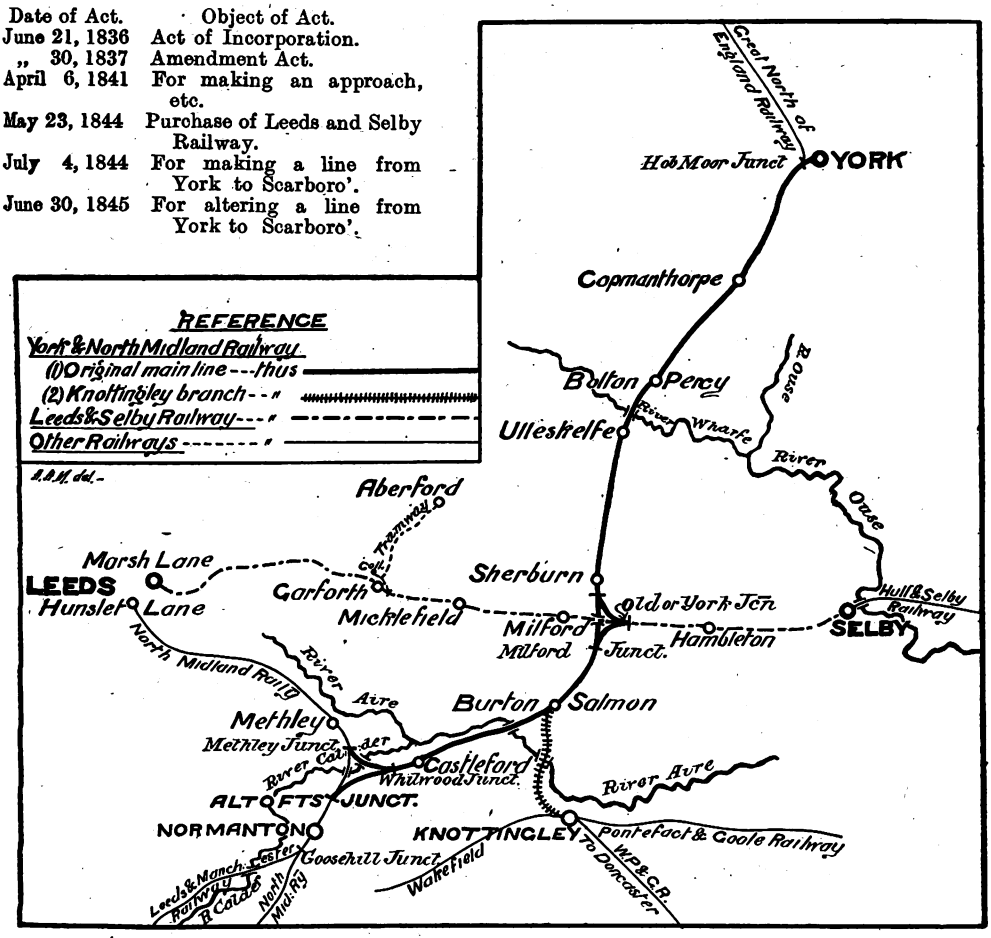
for the construction of various branches, and also for the acquisition of other railways in their immediate neighbourhood, with the result that at the end of 1846 their subscription capital amounted to £4,721,250 in 175,450 transferable shares upon which £1,949,665 had been received and £2,771,585 remained to be paid.

The following is a list of the Acts obtained between 1836 and 1846 :—

Date of Act.	Object of Act.
June 21, 1836	Act of Incorporation.
„ 30, 1837	Amendment Act.
April 6, 1841	For making an approach, etc.
May 23, 1844	Purchase of Leeds and Selby Railway.
July 4, 1844	For making a line from York to Scarboro'.
June 30, 1845	For altering a line from York to Scarboro'.
June 30, 1845	Purchase of Whitby and Pickering Railway.
„ 30, 1845	For making a branch railway.
July 21, 1845	For making a branch railway.
June 18, 1846	For making branch lines in the East Riding (No. 1).
„ 18, 1846	For making branch lines in the East Riding (No. 2).
„ 18, 1846	Extension of Whitby and Pickering line.
„ 26, 1846	For making a railway from York to Leeds.
July 27, 1846	For widening main line.
„ 27, 1846	Authorising lease or purchase of Hull and Selby Railway.

Under the last-mentioned Act the York and North Midland or the Manchester and Leeds Railways were authorised to raise £2,000,000 for the purpose. The details of this transaction will be more fully dealt with under the section dealing with the Hull and Selby Railway.



YORK AND NORTH MIDLAND RAILWAY AND ASSOCIATED LINES AT THE TIME OF OPENING—JULY 1ST, 1840.

The Company was authorised, by one of its Acts passed in 1844, to subscribe £50,000 to the North British Railway, in return for which they received 2,000 original shares of £25. These shares, as George Hudson stated to the shareholders, could be sold at any time which seemed advisable. He also stated that the Company had had an allotment of £2,000 shares in the Hawick Branch of the North British Company which

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had been sold at a profit of between £6,000 and £7,000.

The original stations on the line other than York were Copmanthorpe, Bolton Percy, Ulleskelf, Sherburn, Burton Salmon and Castleford. Afterwards Church Fenton and Milford Junction stations were added, but the latter has been closed since September 3rd, 1904, and is now simply a junction.

Railway. A partial opening had, however, taken place between Sherburn and Burton Salmon on May 11th, 1840. On the day of the opening, Hudson, then Lord Mayor of York, saw the first passengers leave York for London *viâ* Normanton, Derby and Rugby. The Methley Branch was opened on July 27th, and the south curve between Milford Junction and York Junction on November 9th, 1840

YORK & NORTH MIDLAND

RAILWAY

The Public is respectfully informed that on and after MONDAY the 9th November, the Trains will leave the YORK STATION at the following Hours.

FROM

York to Leeds, Selby, Hull,

AND INTERMEDIATE STATIONS.

8		A. M.
11	30	
3		P. M.
6		

The Trains leave Leeds and Selby at the same Hours.

FROM

York to Wakefield, Sheffield, Derby, Birmingham, Nottingham, London,

AND INTERMEDIATE STATIONS.

* 6	30	A. M.	*(Mail.)*
* 8	45		
* 11	30		
4		P. M.	
6			*(Mail.)*

The Trains marked thus * are in connection with Manchester Trains from the Normanton Station.

ON SUNDAYS.

FROM

York to Hull & Selby.

6 30 A. M.
6 P. M.

From Selby to York.

8 A. M.
6 P. M.

TO AND FROM

York and Leeds.

8 A. M.
6 P. M.

York to London.

7 15 A. M.
4 P. M.

TIME-TABLE POSTER ISSUED UNDER DATE OF NOVEMBER 9TH, 1840.

The line was opened for traffic from a temporary station outside the city walls from York to York Junction, on the Leeds and Selby line, on May 30th, 1839, and throughout on July 1st, 1840, the same day as the opening of the North Midland

The earthworks, taken as a whole, were light, the principal work being a cutting at Fairburn, about a mile south-west of Burton Salmon, which was about 60 chains long with an average depth of 48 ft. Gradients were remarkably easy, the ruling one being

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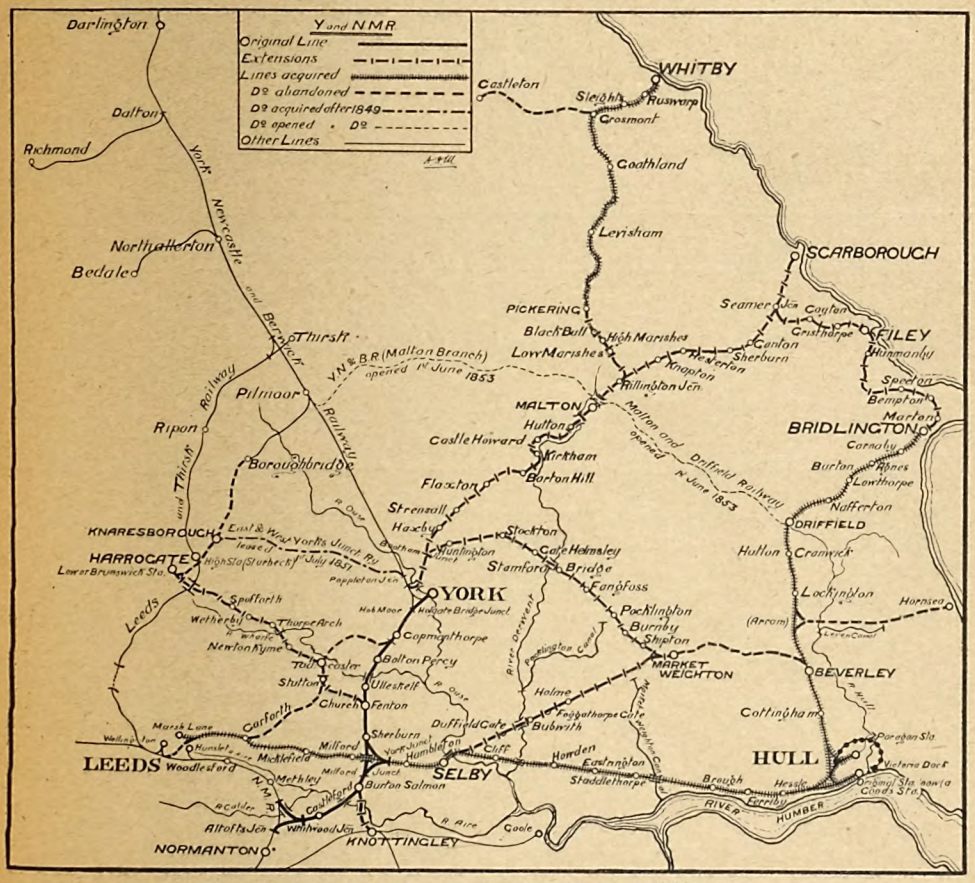
1 in 484. The summit of the line was at Altofts Junction, 49¾ ft. above the York terminus. The number of bridges on the line were 31, but the three principal ones were those over the rivers Wharfe, Aire and Calder. That over the Wharfe is situated between 25 and 30 chains north of Ulleskelf and is 274 ft. long, and consists of one central semi-elliptical brick arch of 60 ft. span, with eight semi-circular land arches each of 15 ft. of Bramley Fall stone, and the rest brickwork. The bridge over the Calder, which is on the skew principle, is situated on the Methley branch, about half-a-mile west of Whitwood Junction, and consists of three semi-elliptical arches each of 50 ft. span on the square and 51 ft. 9 in. on the skew. The arches are 3 ft. in thickness and the piers 8 ft. The ordinary depth of water is 12 ft., and the height from the surface to the



YORK AND NORTH MIDLAND RAILWAY IN 1849—50.

span. The structure generally is of brick and the cutwaters and dressing of Bramley Fall stone.

The Aire Bridge is situated about 1½ miles south-west of Burton Salmon, not far beyond the Fairburn cutting, and consists of three brick arches of 56 ft. span of semi-elliptical form, the height from the surface of the water to the springing of the arches being 11 ft. 6 in. The piers are of 9 ft thickness each, and the total length of the structure is 265 ft. The dressings, etc., are springing of the arches 13 ft. The length of the bridge, which is built of brick and stone, is 263 ft.

Gauge was 4 ft. 8½ in. where stone blocks were used and 4 ft. 9 in. where sleepers were laid. The rails were of single parallel form and weighed 54¼ lbs. to the yard, and were secured to the chairs by an iron pin passing through a perforation in a lateral projection of the chair. The ballasting was of sand or broken stone. Carriages consisted of first, second and third class. The first class

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carriages were of the ordinary form, in three compartments and each holding six passengers. The second class carriages were in four compartments and held altogether 40 passengers. They were open at the sides, with closed ends, the roof being supported by upright iron standards. The width was 7 ft. The third class carriages were altogether open, with seats ranged lengthwise, four seats 14 in. wide to each carriage. The whole width of the carriage was 8 ft. There were also a few mixed carriages.

The first eight locomotives were all supplied from the works of Robert Stephenson & Co., Newcastle, and were six-wheeled single engines. The following is a list, with the principal dimensions :—

Name.	Date.	Cylinders.	Driving Wheels.	L. and T. Wheels.	No. of Tubes.
Lowther	1838	11″ × 18″	5′ 6″	3′ 9″	69
Zetland	1839	12½″ × 18″	5′ 6″	3′ 9″	86
Stephenson	1839	12½″ × 18″	5′ 6″	3′ 9″	86
Ebor	1839	11″ × 18″	5′ 6″	3′ 9″	69
York and Leeds	1839	11″ × 18″	5′ 6″	3′ 9″	69
Harcourt	1840	12½″ × 18″	5′ 6″	—	80
Wellington	1840	12″ × 18″	5′ 6″	—	80
Hudson	1840	12½″ × 18″	5′ 6″	—	103

The general type of six-wheel passenger engine in use about 1844 had single drivers 6 ft. in diameter, a heating surface of 523 sq. ft., a firebox of 52 sq. ft., and a steam pressure of 60 lbs. They were fitted with the gab motion, and the cylinders were 14 in. by 18 in. stroke. The weight of the locomotive was about 12 tons.

In 1845 Messrs. R. Stephenson & Son built one of their patent long-boiler type of engines, known as the *Great A*, especially for the speed contests with the broad gauge; another was called the *Prince of Wales*. It was a six-wheel engine with single drivers 6 ft. in diameter, and had a total heating surface of 903 sq. ft. It was purchased by the York and North Midland Railway and worked regularly on the line for many years.

In 1847–1848 ten locomotives of the "Jenny Lind" class were constructed for the Company and were numbered 88 to 95 inclusive, and 102 and 103. When these were taken over by the North Eastern Railway in 1854 they were re-numbered 319 to 326 inclusive, 333 and 334, "Jenny" herself (No. 90) becoming No. 321. They were six-wheel locomotives with 6 ft. single drivers and cylinders 15 in. by 20 in.

Amongst other locomotives were the following:

Firefly and *Greyhound*		0–4–0		Passenger locomotives.
Achilles		0–6–0		Goods locomotive.
No. 263	1841	2–2–2T	5′ 6″	drivers—Stephenson.
No. 264	1841	0–4–0	5′ 2″	,, — ,,
No. 272	1845	2–2–2T	4′ 9″	,, —Kitson.
No. 278	1846	0–4–0	5′ 2″	,, —Murray & Jackson.

Nos. 263 and 272 were originally six-wheel single driver tank locomotives, but were, with others, rebuilt as four-coupled (0–4–0) tender engines with cylinders 15 in. by 20 in. and 5 ft. drivers.

Another old York and North Midland locomotive was taken over by the North Eastern Railway and numbered by them 2254 on the duplicate list after having been reconstructed. The cylinders were 16 in. by 22 in.

The engine drivers earned 5s. a day of 12 hours, and the firemen 3s. In those times there was no eight hours a day.

The signals consisted of disc boards oblong in form, with rounded corners, but semaphores were eventually adopted at junctions, with a round top.

The York terminus was situated within the city walls, close to Toft Green and Tanner Row, and was joint with the Great North of England Railway. It was opened for traffic on January 11th, 1841, and was considered a fine building for those early days, being formed of brickwork with stone dressings, covered in by a wrought iron triangular roof. The principal building faced Tanner Row, having a large booking office in the centre, with waiting rooms on either side, also a post office, parcel office, etc., on the ground floor. On the first floor were the offices of the York and North Midland and Great North of England Railways. The appearance of the building towards Tanner Row was improved by a colonnade and basement of the Tuscan order in stone. The remainder of the building was of brick with

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stone dressings. The departure platform, which was nearest the booking office, was 600 ft. long by 18 ft. wide. The arrival platform, which was of similar dimensions was on the opposite side, and adjoining were first and second class refreshment rooms. A view of the exterior of the station was given in the RAILWAY MAGAZINE for 1908, Vol. XXIII., page 267.

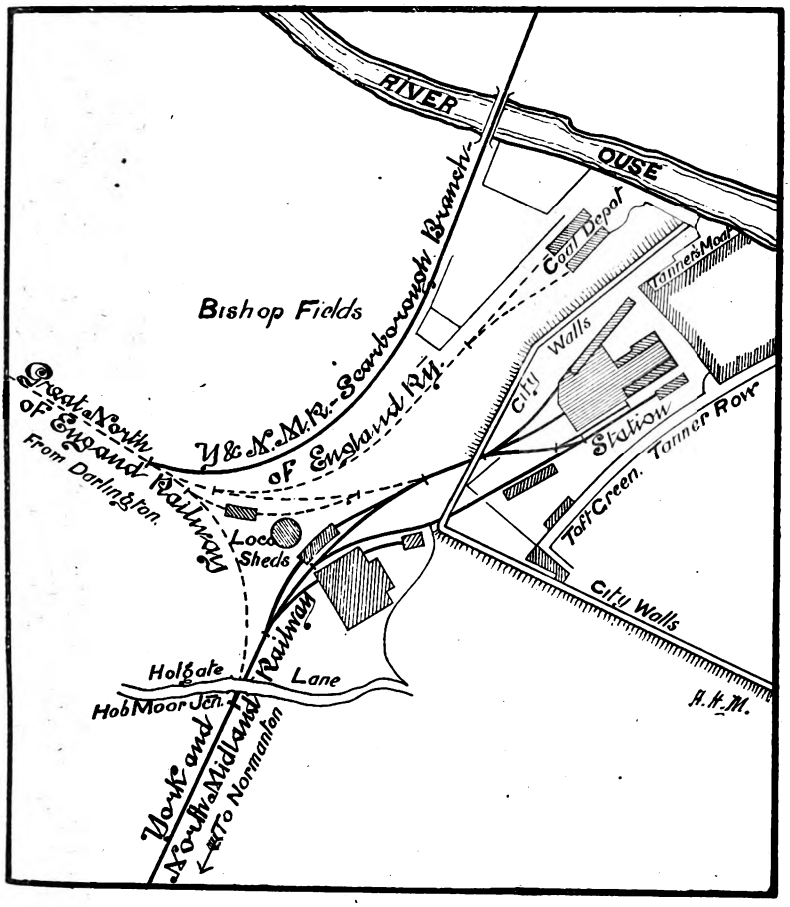
After the line had been opened as far as York Junction, on the Leeds and Selby line, the first dividend declared was 4½ per cent., and after the line was opened throughout a dividend to 7 per cent. was declared.

Although the physical terminus at the south end was at Altofts Junction, the practical terminus was at Normanton station, on the North Midland Railway, the York and North Midland running powers having been adjusted when the former line was opened.

The Manchester and Leeds Railway had also procured running powers into Normanton, which was eventually made joint between the three companies. In 1850 the York and North Midland, by an arrangement with the North Midland Company, procured running powers into Leeds (Wellington) station *viâ* Castleford, Whitwood Junction and Methley, and these powers are exercised to this day.

In 1845 there were only eleven trains out of York for the South and seven for the North. In 1848 the 9.30 express *ex*-Euston left Normanton at 3 p.m., and arrived at York at 3.40 p m. and left at 3 50 for Newcastle, Berwick and Edinburgh, arriving at the latter place at 10.35 p.m. The train was first class only.

In September, 1849, there were ten down trains from Normanton and one from Leeds only on week-days, and two on Sundays



THE ORIGINAL STATION AT YORK.

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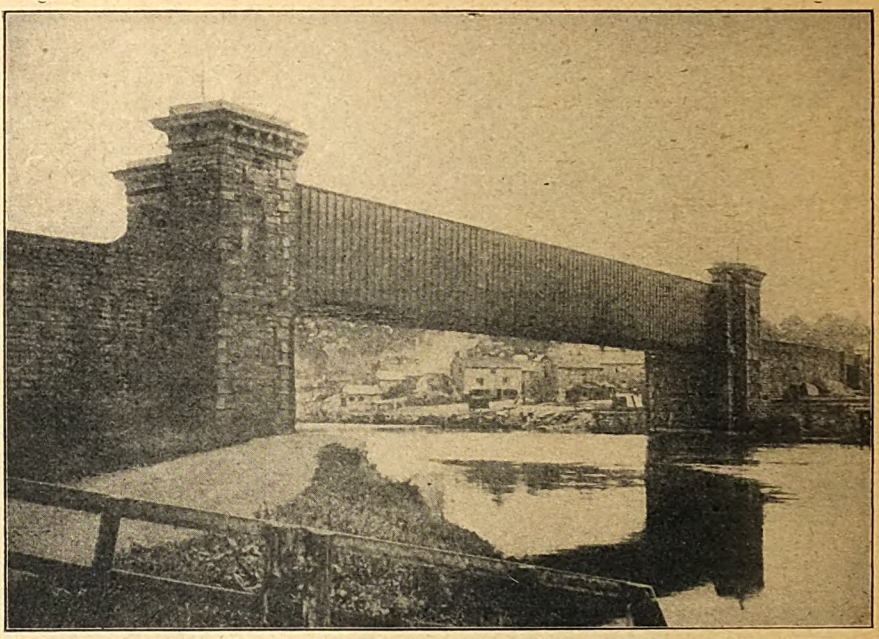


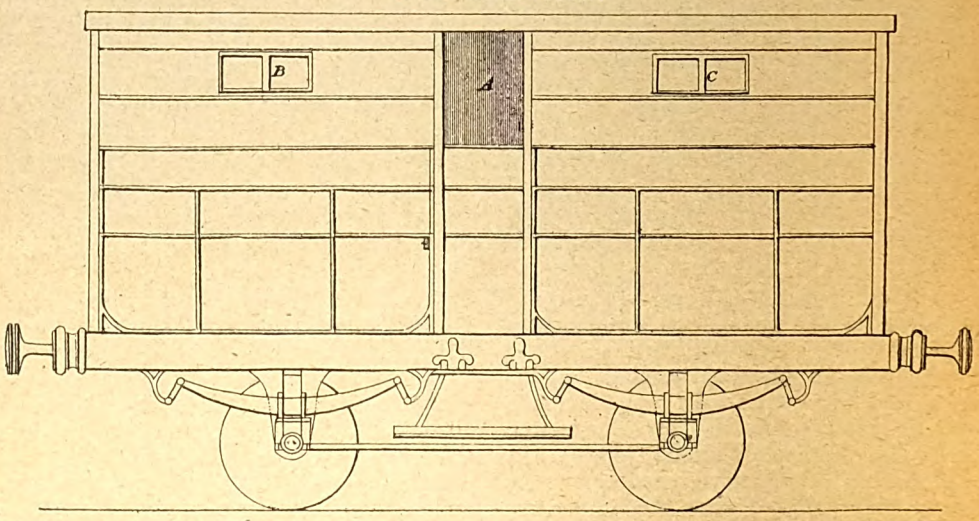
BRIDGE OVER THE RIVER AIRE AT BROTHERTON: BURTON SALMON AND KNOTTINGLEY BRANCH.

from Normanton and one from Leeds. In the reverse direction, there were seven trains to Normanton and one to Leeds on weekdays, and three to Normanton and one to Leeds on Sundays. The quickest trains were the 4 p.m. *ex*-York and the 2.10 p.m. *ex*-Normanton, both of which covered the journey in 40 min.

When the Company acquired the Leeds and Selby Railway in 1844, an arrangement was entered into with the Midland Railway whereby the passenger traffic to and from Leeds was worked *viâ* Castleford and Methley, leaving the merchandise and mineral traffic to be worked from York Junction to Leeds *viâ* Garforth during the continuance of the arrangement.

On February 19th, 1848, a special train, known as the "Budget Express," was run by Messrs. W. H. Smith & Sons from Euston

SIDE ELEVATION.



THIRD CLASS PARLIAMENTARY CARRIAGE FOR 40 PASSENGERS: YORK AND NORTH MIDLAND RAILWAY.

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to Edinburgh and Glasgow with *The Times* report on the declaration of the Budget. The train left Euston at 5.35 a.m., Altofts Junction at 9.37, and arrived at York at 10.6 a.m., a distance of 23 miles 41 chains, in 29 min. On July 12th, 1848, the late Prince Consort, when travelling to York, left Euston at 9 a.m. and Normanton at 1.53 p.m., and arrived at York at 2.39, the journey time being 46 min.

On Thursday, May 24th, 1849, a special meeting of the Company was held at York to consider the propriety of appointing a Committee of Enquiry into the affairs of the Company and also to fill up four vacancies in the directorate. After some discussion Messrs. George Kinnear, of Glasgow, John Swann, of York, John Brooke, of Brighouse, Edward Lloyd, of London, Henry Bull, of London, and Michael Stocks, of Halifax, were appointed as a Committee of Investigation, with Mr. George King as Secretary. A resolution was also passed giving the Committee full powers.

At the half-yearly meeting held at York on September 6th, 1849, it was stated that no dividend could be declared. Thereafter a special general meeting was held to receive the second report of the Committee of Investigation, which was adopted. On Wednesday, October 31st, 1849, the third report of the Committee was laid before a special general meeting of the Company. The document entered very minutely into the history of the line and its numerous branches, purchases, etc., making a pamphlet consisting of 60 pages (crown 8vo) of print and *xxii.* pages of appendices.

Amongst other things the report attributed the principal, if not the entire, cause of the Company's depreciated condition to the extensions made since the year 1844. The railway extension and competition mania commenced about the middle of that year, and the Committee therefore drew a line between the undertakings entered into before and after 1844, and after having pointed out what would have been the position of the Company in 1849 had their powers been restricted to those undertakings granted up to the end of the Session of 1844, traced the inroads which every subsequent accession of territory had thereafter made upon the Company's dividends. In order to stave off the ill-effects as shown in the third report before referred to, and under the hope that those effects were only of a temporary character, recourse was had to fictitious half-yearly statements by overstating revenue and understating the working charges.

The principal recommendations and conclusions contained in the third report are considered in the next section, dealing with the various branch lines associated with the York and North Midland Railway.

(*To be continued.*)

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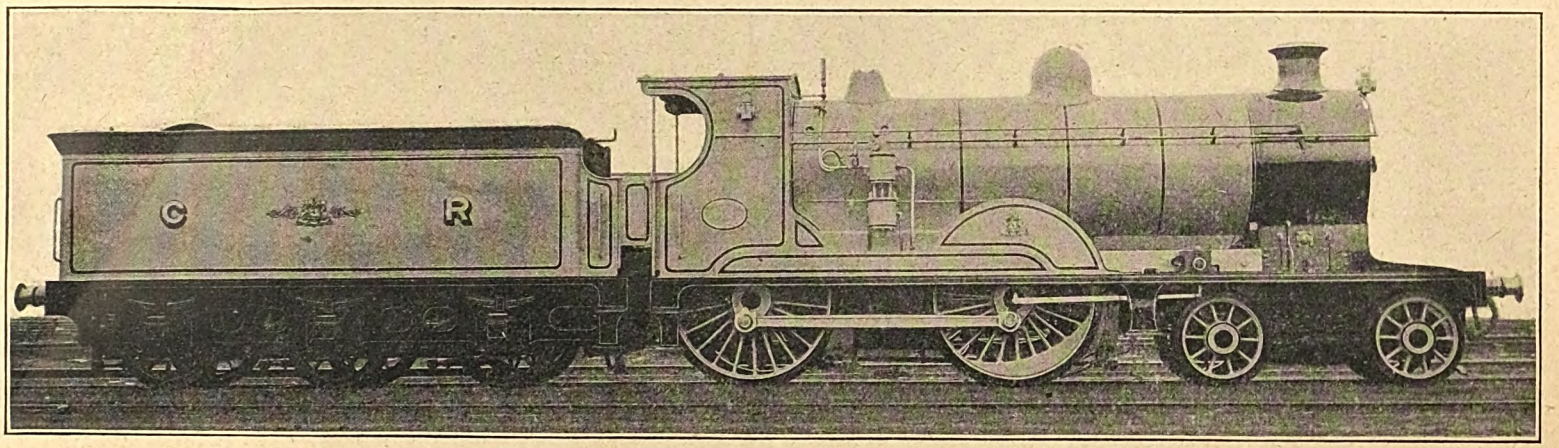
NEW 4-4-0 SUPERHEATER LOCOMOTIVE: CALEDONIAN RAILWAY.

Designed by Mr. W. Pickersgill, Locomotive Superintendent.



BY the courtesy of Mr. W. Pickersgill, Locomotive Superintendent, we are able to illustrate a new 4–4–0 superheater express locomotive constructed at the St. Rollox works, this being the first for which Mr. Pickersgill has been responsible since taking charge on the retirement of Mr. J. F. McIntosh. Changes as compared with previous Caledonian practice are not great, but in a number of details Mr. Pickersgill has made slight variations. The superheater is of Robinson type (24 elements). An unusual feature is that the mechanical lubricator is operated from a return crank attached to a coupling rod pin. The engine is painted and lined to usual Caledonian standards. The tender is six-wheeled, instead of double bogie pattern.

LEADING DIMENSIONS.

Cylinders	20 in. by 26 in.
Coupled wheels	6 ft. 6 in. dia.
Bogie wheels	3 ft. 6 in. dia.
Working pressure	170 lb. per sq. in.
Grate area	21 sq. ft.
Tender tank capacity	4,200 gallons
,, fuel space for coal	5 tons

Heating surface of 5 in. tubes	361·3 sq. ft.
,, ,, $1\frac{3}{4}$ in. tubes	858·7 sq. ft.
,, ,, firebox	145 sq. ft.
,, ,, superheater elements	295 sq. ft.
Total	1,660 sq. ft.
Weight of engine and tender in working order	110 tons

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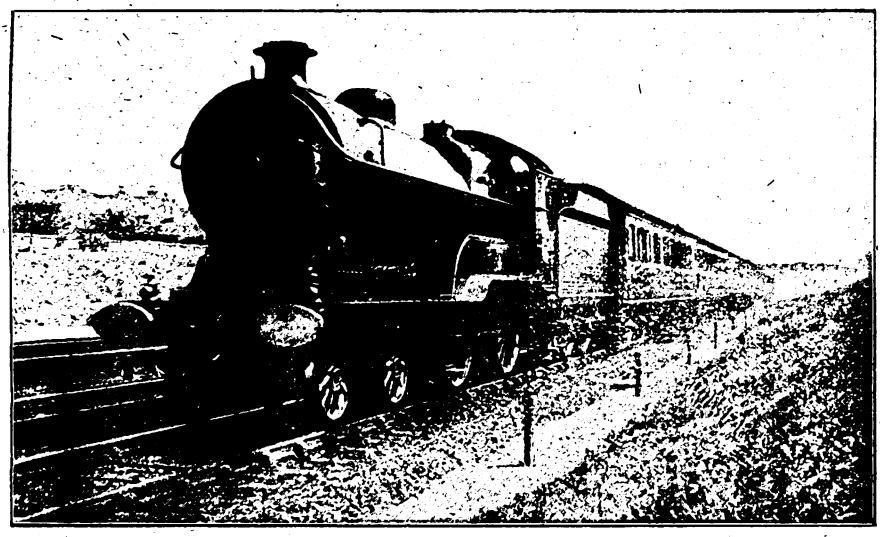

Photo] [*F. W. Curtis.*

GREAT CENTRAL RAILWAY.

Down Nottingham Special Train: 4-4-0 engine, No. 433, *Edwin Beazley.*

British Locomotive Practice and Performance.

By CECIL J. ALLEN.

A REFERENCE made in the February article to the "rail-joint method of timing" appears to have aroused the curiosity of some readers, who are at present unacquainted with it, and desire some enlightenment on the matter. So I may perhaps be pardoned for devoting a paragraph or two to this topic before turning to performance. As most of those who engage in timing the running of express trains will agree, one of the chief sources of interest attaching to performance on an undulating stretch of line is the recording of maximum and minimum speeds on down and up grades respectively, as amplifying the survey of the work obtained by merely timing the train past the various stations and junctions on the journey. Now to the average observer such observations entail a corner seat in the compartment, and one on the mile-post side of the coach at that, while on such lines as the Great Western Railway, where the position of mile-posts changes on various sections from one side of the line to the other, nothing less than an empty or a reserved compartment will meet the case adequately. This is a matter, however, in which the railway company and the railway enthusiast can hardly be expected to see eye to eye, and unless such observations are to be neglected, save under the favourable circumstances just mentioned, it becomes imperative to devise some means of accurately estimating the speed when one is denied the privilege of a window seat. The same means will prove useful on those peculiarly exasperating occasions when the steam persists in beating down and obscuring the mile-posts, or, again, after nightfall, when all recording from mile-posts has perforce to cease abruptly.

Such a method is that of timing quarter, half or whole miles by the number of rail joints passed over. It is a method involving a good deal of practice, as it demands a familiarity with the sounds produced from the passage of the coach wheels over the joints in the rails, and an ability to determine the lengths of the rails which are being run over, as well as a knowledge of the respective sounds made by coaches of different wheel arrangements. The novice will fall into many pitfalls at first, and

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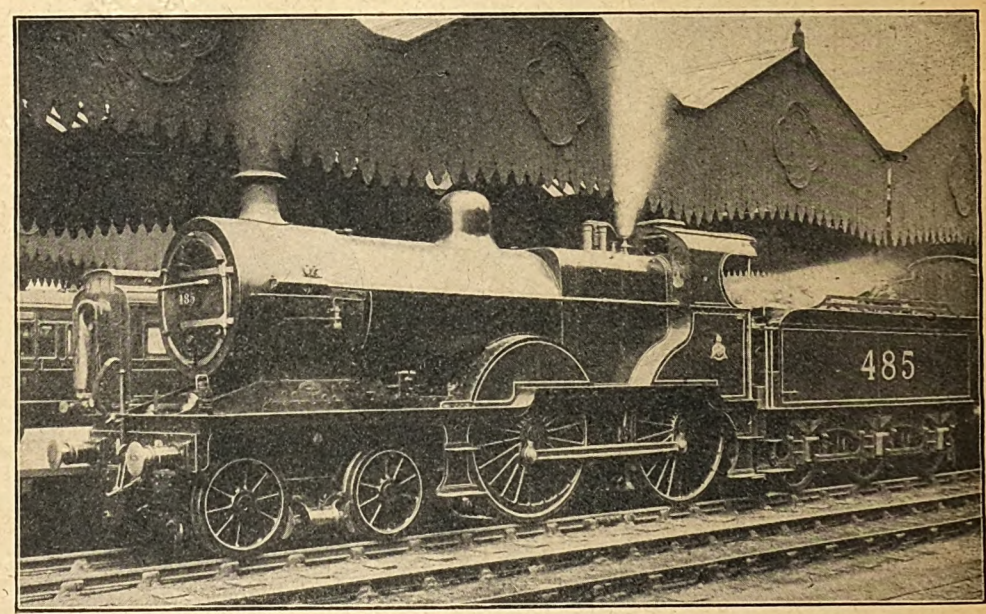
obtain some results which will astonish him exceedingly, but with care and common-sense this method of speed estimation may be made as accurate as that from the mile-posts. Indeed, it is sometimes even more so, as displaced mile-posts—such, for example, as the mendacious post or posts immediately south of Little Bytham, on the Great Northern main line—are not uncommon. Every reader is familiar with the rhythmic "hammer" of the wheels of a train over the joints in the rails, but few, perhaps, have troubled to realise that each set of blows represents a fixed distance. In timing therefrom the sounds due to different types of rolling stock require first to be mastered.

When one is travelling in a six-wheeled coach, each of the three pairs of wheels can always be heard distinctly passing over the joint, since the average length of rail exceeds the length of wheel-base of the coach; consequently, in this case every third "beat" indicates a rail-joint. In a bogie vehicle, however, it is generally only the wheels on the bogie at the observer's end of the carriage that can be heard (those at the trailing end being drowned by the passage of the leading bogie over the next succeeding joint), and the noise produced by them, in, say, an eight-wheeled coach, will be noticed to sounds as follows: beat, beat—pause—beat, beat—pause, and so on. In this case, therefore, each pair of beats indicates a joint, and although the wheels of the other bogie of the coach, or of the adjacent coach, may also be heard, they are always fainter in sound, and thus easily distinguishable. A twelve-wheeled vehicle, of course, gives beats in rapid succession in sets of three, with the same intervening pauses as the eight-wheeled carriage. Generally speaking, the bogie coach is, acoustically, the easiest of any in which to employ this method.

The greater difficulty, however, is for the observer to know the lengths of rail over which he is running, as obviously the variation in rail lengths directly affects the results obtained. Rails may be found in British main lines of all lengths from 24 ft. up to 60 ft. long, and every company is engaged in substituting longer lengths for those previously in use, so that even on any one main line there may be constant changes. But some general rules may be laid down for the guidance of the novice. On the London and North Western main lines the rails are almost universally 60 ft. in length; the Great Western is laid principally with 32 ft. rails, but these are being replaced with rails 44 ft. 6 in. long,



Photo] [*P. F. Cooke.*

MIDLAND RAILWAY.

Rebuilt superheater 4–4–0 engine, No. 485, in Central Station, Manchester.

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the Old Oak-Aynho line, for example, being laid entirely with this length. The Midland Railway employs more 36 ft. rails than any other length, but a quantity of 45 ft. rails have been put into the main lines; on the other hand, the Settle and Carlisle section boasts principally 30 ft. rails. Most of the Great Northern main lines have now been relaid with 45 ft. rails, although both 36 ft. and 30 ft. rails can be found in places. The majority of British companies have laid their lines in the past exclusively with 30 ft. rails, and are now relaying entirely with 45 ft. rails, the proportion of the one to the other varying with the company concerned. This applies to the North Eastern, Great Eastern, Lancashire and Yorkshire, London and South Western, London, Brighton and South Coast, South Eastern and Chatham, and Glasgow and South Western Railways, and also the principal Irish lines. A journey on the Great Central Railway from London to Manchester produces some rather curious results. From Marylebone to Harrow, and from Quainton Road Junction to Nottingham, the rails are mostly 30 ft. long, relaid in occasional patches with 45 ft.; between Harrow and Quainton Road, on the Great Central and Metropolitan joint line, 24 ft., 30 ft., and 45 ft. rails are encountered, while from Nottingham on to Manchester, 36 ft. is the principal length. Should the traveller elect to journey *viâ* Wycombe, he will find 36 ft. rails from Neasden to Northolt, and Ashendon to Grendon, with Great Western Railway 44 ft. 6 in. rails sandwiched in from Northolt to Ashendon! The North British offers similar variations to the harassed compiler of logs, 24 ft., 30 ft., 40 ft., and 48 ft. rails being met with indiscriminately; on the neighbouring Caledonian Railway, 32 ft. is the length mainly used, recently re-laid in more or less isolated lengths with 48 ft. rails.

Now, all the foregoing may sound very complicated, and, indeed, on some lines, as for example the Great Central or the North British, it would certainly be almost impossible for the tyro to pursue his researches with any degree of accuracy. In such cases nothing but a perfect

GREAT CENTRAL RAILWAY—WYCOMBE-WOODFORD.

Distance.	Engine, 4-4-0 superheater, No. .. Name .. .. Driver .. .. Load (tons)	Schedule.	430 *Sir Edward Fraser.* Bailey. 175		432 *Purdon Viccars.* Atkinson. 135	
Miles.		Mins.	M. S.	Max. and Min. Speeds. m.p.h.	M. S.	Max. and Min. Speeds. m.p.h.
0.0	High Wycombe .. .. .. dep.	0	0.00		0.00	
2.2	West Wycombe .. .. .. pass	—	4.40		4.10	
5.0	Saunderton.. .. .. .. „	—	8.05	50½	7.15	56¼
8.1	Princes Risborough .. .. „	12	11.20	75	10.20	
				82		77½
13.5	Haddenham .. .. .. „	—	15.25	75	14.45	68
17.5	Ashendon Junction .. .. „	—	18.30	80¼	18.10	74
18.9	Wotton .. .. „	—	19.40	75	19.25	68
20.9	Akeman Street .. .. .. „	—	21.10	82	21.10	
23.4	Grendon Junction .. .. „	26	23.10	75	23.30	64¼
				77½		70¼
25.4	Calvert .. .. „	—	24.45	71½	25.20	
				75		
31.1	Finmere .. .. „	—	29.45	61½	30.35	58½
				72½		71½
35.9	Brackley .. .. „	—	34.00	61½	35.05	57½
39.1	Helmdon .. .. „	—	37.05	72½	38.20	64¼
42.7	Culworth .. .. „	—	40.10	65	41.50	57½
44.0	Culworth Junction .. .. „	—	41.10 *	77½	†44.00	
45.7	Woodford .. .. arr.	49	43.55		48.45	
45.7	Net times (mins.)	49	43¼		45¼	

* Signal check. † Dead stand for signals, very slow stop.

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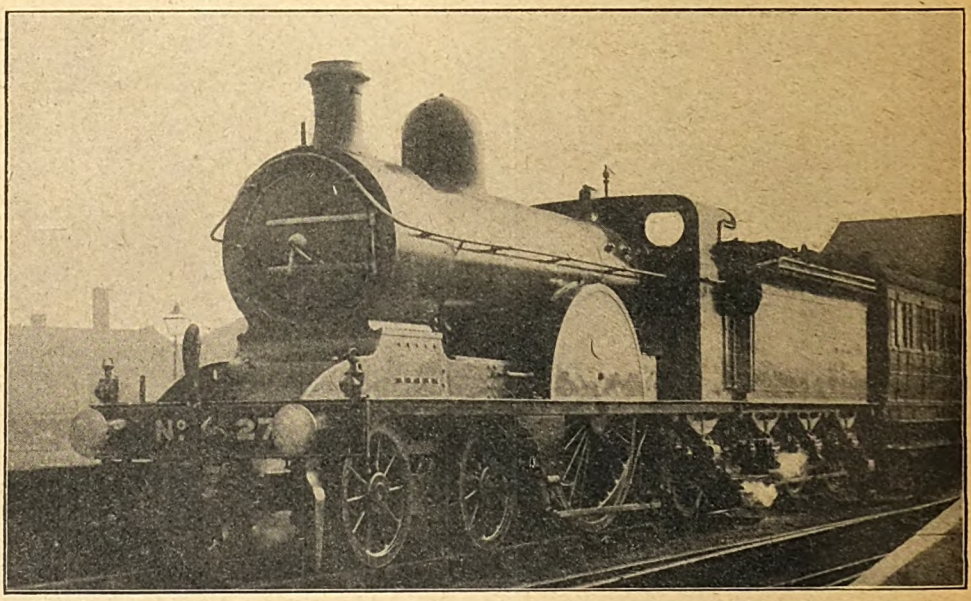
acquaintance with the various sounds, and a familiarity with the route traversed, would enable reliable observations to be made. The method of timing, once the rail-length has been ascertained, is simply to count the number of joints that go to make up a quarter, a half, or a full mile, and to take the time employed in covering them. When an ordinary type of watch is employed, this method is probably more accurate even than the mile-post method to the experienced observer, as the eye need not be removed from the face of the watch. But of course the only really exact means of timing maxima and minima—at least in regard to quarter-miles, where even an error of one second may mean the difference between, say, 75 and nearly 82 miles per hour—is by the use of the chronograph. In counting up the right number of joints it is necessary, of course, to commence at zero, counting 0, 1, 2, 3, 4, 5, and so on, as there is obviously one more joint than the number of rails required to make up the given distance. Where speeds are high, it is sometimes convenient to count only alternate joints, using the intervening ones to balance numbers counted as in two syllables. This entails halving the figures noted below, and applies most conveniently with 30 ft. rails. I give herewith a table showing the number of rail-lengths that will be passed over in covering various distances :—

Length of Rail.	No. of rail lengths passed over in		
	¼-mile.	½-mile.	1 mile.
24 ft. 0 in.	55	110	220
30 ,, 0 ,,	44	88	176
32 ,, 0 ,,	41	82½	165
36 ,, 0 ,,	36½	73	146½
40 ,, 0 ,,	33	66	132
44 ,, 6 ,,	29½	59	118½
45 ,, 0 ,,	29	58½	117
48 ,, 0 ,,	27½	55	110
60 ,, 0 ,,	22	44	88



Photo] [*J. Macartney-Robbins.*

GREAT NORTHERN RAILWAY.

4-2-2 engine, No. 270, on train at Peterborough.

The list looks rather a formidable one, but in point of fact those who employ this method will find that the figures for 30 ft. and 45 ft. rails are those that they need the most. Nothing but constant practice will make perfect, but there are certain little aids which will hasten this end. For instance, if the traveller takes the trouble, on those occasions when he is able to secure a window-seat on the mile-post side, to count the number of joints from post to post, he will familiarize himself rapidly with the practice of the company concerned. A comparison of the times between stations also, whose distances

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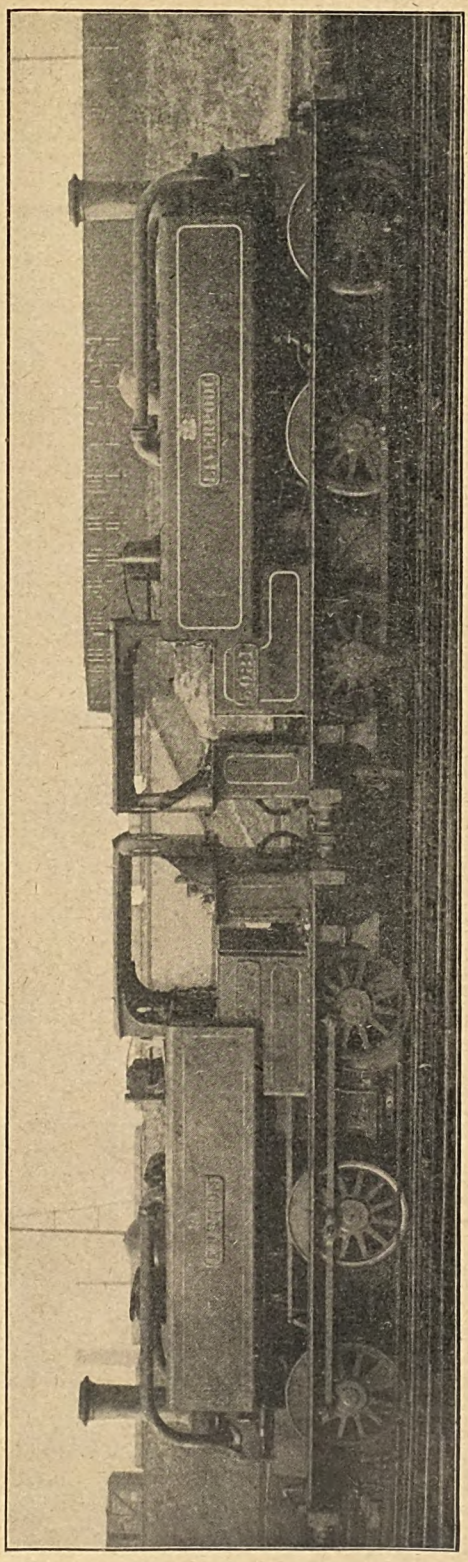
apart may be ascertained from "Bradshaw," will act as some check on any too extravagant estimates of speeds. Needless to say, no attempt should be made to count rail-joints when the train is passing over switches and crossings, with their short and varied rail-lengths, or over those occasional stretches of line where irregular closure rails have been employed for short distances. Generally speaking, however, the rail-joint method of speed estimation is of real value, and, although I accept no responsibility for the fearful and wonderful results that some of my friends will probably obtain in their initial experiments, I trust that more than one reader will find it of material assistance when he is obliged to compile his records under difficulties.

The well-known writer of an article in a contemporary dealing with locomotive performance recently remarked that to deal with a subject of this kind at a time like the present was rather akin to "making bricks without straw." I must confess that this expresses anything but my own experience, and the use that has been made of correspondents' runs in the last two issues must not be taken as indicating that my own store of material is by any means exhausted. Indeed, it would be pardonably astonishing if the 10,146 miles with which I have opened the first ten weeks of the year had not produced something worthy of record! This month, therefore, some really peerless examples of locomotive work that it has been my good fortune to record on recent journeys shall be described.

In going north a few weeks ago, I took the opportunity of travelling by the 10 a.m. train from Marylebone in place of the corresponding train from King's Cross, and the venture was rewarded to the extent of a finer run than I have ever previously recorded on the Great Central Railway—which is saying a good deal! The load was a moderate one, consisting as it did of four of the latest 60 ft. eight-wheelers, and a first class dining and kitchen coach, weighing 166 tons empty, and 175 tons with passengers and luggage. Such a train might be compared as to weight with say, a Midland express of 2 twelve-wheeled diners, 3 eight-wheeled corridors, and a six-wheeler, or one of six 60 ft. eight-wheelers on the Great Western Birmingham service, or one of six non-corridor eight-wheelers and a six-wheeler on the North Eastern Railway 1.9 p.m. from



Photo] LONDON AND NORTH WESTERN RAILWAY. [P. F. Cooke.

Special condensing saddle tank engines used for working boat trains from Edge Hill to the Riverside Station, Liverpool. Nos. 3186 *Euston* and 3021 *Liverpool*.

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Darlington to York. I mention these by way of comparison, as the new Great Central 60 ft. vehicles are exceedingly heavy, corridor cars weighing 34 tons each, and restaurant cars 37 tons. The engine was a large 4-4-0 superheater of the "Director" class—No. 432, *Sir Edward Fraser*—in charge of our old friend, Driver Bailey, who, I fear I must confess, was aware of the fact that I was on the train. However, as far as High Wycombe, our progress was quite staid and decorous; we took 8 min. 50 sec. to Neasden, 5·1 miles, and 16 min. 55 sec. to Northolt, 11·6 miles, slacking very carefully over both junctions, as well as through Ruislip, where we had to take the platform line, as the main line was occupied by a goods train. After this a steady 55·6 m.p.h. was the rate maintained up the 1 in 175-254 to Beaconsfield, and then with a gentle descent at a maximum of 64·3 m.p.h. to Wycombe, we stopped at that town 35¼ min. after leaving Marylebone, or 34 min. net for the 27·9 miles, the allowance being 36 min.

But it was on the succeeding run from Wycombe to Woodford—45·7 miles, for which a fairly tight allowance of 49 min. is made—that Bailey displayed the truly astonishing capabilities of his engine. The details are fully set out in the accompanying table, together with those of a previous journey on the same train, which at the time I thought quite remarkable, but which the more recent run completely overshadows. Up Saunderton bank the easiest running of the section was made, the sustained rate on the 1 in 164 barely reaching 50 m.p.h., but once over the summit the pace became fast and furious. In the space of 1¾ miles down at from 1 in 87-161 we accelerated from 50 to 75 m.p.h., passing Princes Risborough at the last-mentioned speed, and the subsequent 3¾ miles at 1 in 200 raised the rate to a well-maintained 81·8. The two miles of level past Haddenham, including ½-mile up at 1 in 264, reduced the speed to 75 m.p.h., but the subsequent mile down at 1 in 200 quickly brought us to 80·3 again. After this there are four level miles past Ashendon Junction,

NORTH EASTERN RAILWAY—DARLINGTON-YORK.

Distance.	Run No.	Schedule.	1	2	3	4	5	6	7
	Engine No.		1209	2203	2200	1672	1207	2195	1244
	Type and Class		4-4-0R	†4-4-2Z	†4-4-2Z	4-4-0R	†4-4-0R	†4-4-2Z	4-4-0R1
	Load (axles)		24	24	—	24	20	23	53
	Load (tons)		165	165	200	170	135	145	365
M. C.		Mins.	M. S.	M. S.	M. S.	M. S.	M. S.	M. S.	M. S.
0. 0	Darlington .. dep.	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.48	Croft Spa .. pass	—	5.00	4.30	4.22	3.54	4.30	4.30	5.15
5.18	Eryholme .. ,,	—	8.25	7.10	7.13	6.14	7.10	7.15	8.15
6.74	Cowton .. .. ,,	—	10.20	8.50	8.47	7.40	8.45	8.55	10.05
10.32	Danby .. .. ,,	—	13.55	11.50	11.49	10.33	11.35	12.00	13.25
								a	
14.14	Northallerton .. ,,	14	17.55	15.15	15.12	13.46	14.45	16.15	16.50
17.46	Otterington .. ,,	—	20.55	18.15	18.10	16.36	17.40	19.50	20.05
21.74	Thirsk .. .. ,,	21½	24.30	21.45	21.43	20.04	21.05	23.35	23.50
26.10	Sessay .. .. ,,	—	28.00	25.15	25.14	23.33	24.35	27.00	27.35
28. 4	Pilmoor .. ,,	—	29.35	26.50	26.49	25.09	26.10	28.35	29.20
30.60	Raskelf .. .. ,,	—	31.50	29.05	28.59	27.23	28.25	30.45	31.45
32.75	Alne .. .. ,,	32	33.35	30.50	30.42	29.09	30.05	32.25	33.30
34.31	Tollerton .. ,,	—	34.45	32.00	31.50	30.20	31.15	33.30	34.45
38.50	Beningbrough .. ,,	—	38.15	35.30	35.14	33.45	34.30	36.50	38.30
							b		
41. 0	Skelton Bridge .. ,,	—	40.10	37.30	37.10	35.45	37.30	38.45	40.30
42.43	Poppleton J'cn. ,,	40	41.25	38.45	38.25	37.00	40.00	40.00	41.45
			c	c	c			c	
44.10	York .. .. arr.	43	44.40	41.40	41.30	39.34	42.50	42.50	44.40
44.10	Net time (mins.) ..	43	44	41¼	41	39½	40¼	40½	44¾
21.4	Otterington to Beningbrough — time		17.20	17.15	17.04	17.09	16.50	*16.45	18.25
	Otterington to Beningbrough — av. sp'd.		72·9	73·2	74·0	73·6	75·1	75·4	68·6

a P.W. check, severe, Wiske Moor. b P.W. check, severe, Skelton Bridge.
c Slight checks outside York. † Superheater engines. * Net time.

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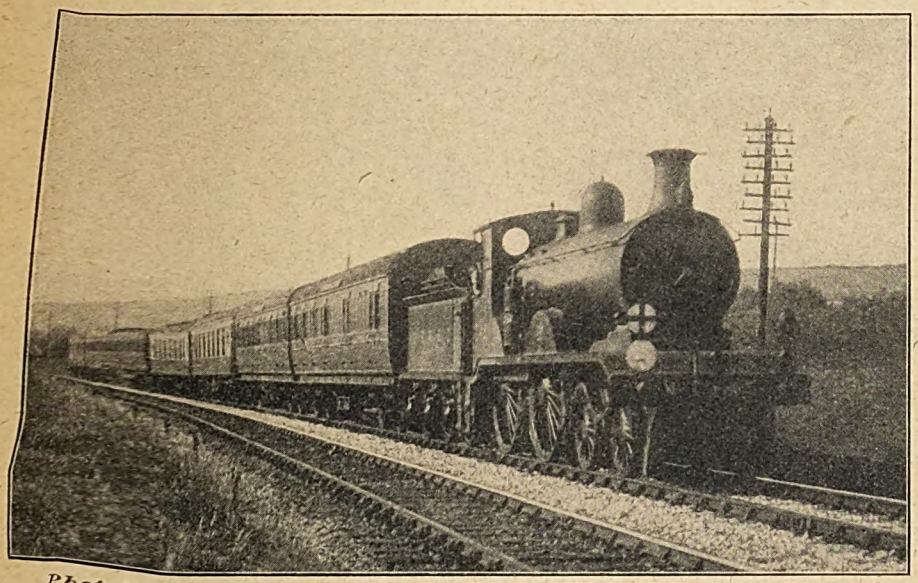
culminating in an ascent of 1 mile at 1 in 200 to Wotton, but this had no more effect than to reduce our rate again to 75 m.p.h., while the subsequent very gradual fall past Akeman Street produced a third maximum of over 80 m.p.h.—81·8 to be exact. A minimum rate of 75 was again touched on the ascending mile at 1 in 176 to Grendon Junction, and we then had another smart sprint on the corresponding downhill mile before Calvert, where 77·5 was the maximum reached. By now we had more than obtained "even time," and it is significant that the *average* speed from Princes Risborough to Calvert—a distance which, save for the initial 4 miles' descent, is well-nigh level throughout—was no less than 77·4 m.p.h.! This was indeed fine running, but better still was to follow.

The 2¼ miles' ascent past Calvert, of which 1⅝ miles are at 1 in 176, was taken "flying" with no lower rate than 71·4 m.p.h.; the subsequent ¾-mile down at the same inclination brought us again to 75 m.p.h. Now followed the longer 5 miles' climb to Finmere, commencing with 1 mile at 1 in 330, and continuing with over 3 miles at 1 in 176; on the latter our sustained speed was 61·6 m.p.h., and I believe we could have continued for miles thus without any further fall. Beyond Finmere the 1¼ miles' descent at the ruling grade produced a top speed of 72·5 m.p.h., and then the 4 miles of Brackley bank, including a full 4 at 1 in 176, were breasted at exactly the same sustained speed of 61·6 m.p.h. The slight undulations past Helmdon were raced over at from 65 to 72·5 m.p.h., and a final "burst" at 77·5 down the 1¾ miles of Culworth bank should have taken us rapidly into Woodford had not adverse signals slightly delayed the conclusion of the run. Nevertheless, we arrived even yet a modest 5 mins. ahead of time! This really was in all respects a most phenomenal run. The 45·7 miles from High Wycombe to Woodford had been covered, start-to-stop, in 43 min. 55 sec., or 43¼ min. net, despite the intervening vertical rise of 620 ft.—in fact, the average tendency of the road is very decidedly against the engine, only the Risborough-Grendon stretch being really favourable. From Princes Risborough to Culworth Junction, 35·9 miles, the *average* speed had been no less than 72·2 m.p.h., and during the whole of this distance the speed had ranged from 61·6 to 81·8 m.p.h., at no time falling below the mile-a-minute rate. And all these astounding feats were performed with a train which, as I have already shown, was of by no means negligible weight, as judged by the standard of some of the "crack" expresses of other companies.



Photo] [T. B. Welch.

LONDON, BRIGHTON AND SOUTH COAST RAILWAY.

3.40 p.m. Victoria-Brighton Express. 4-4-0 locomotive, No. 45.

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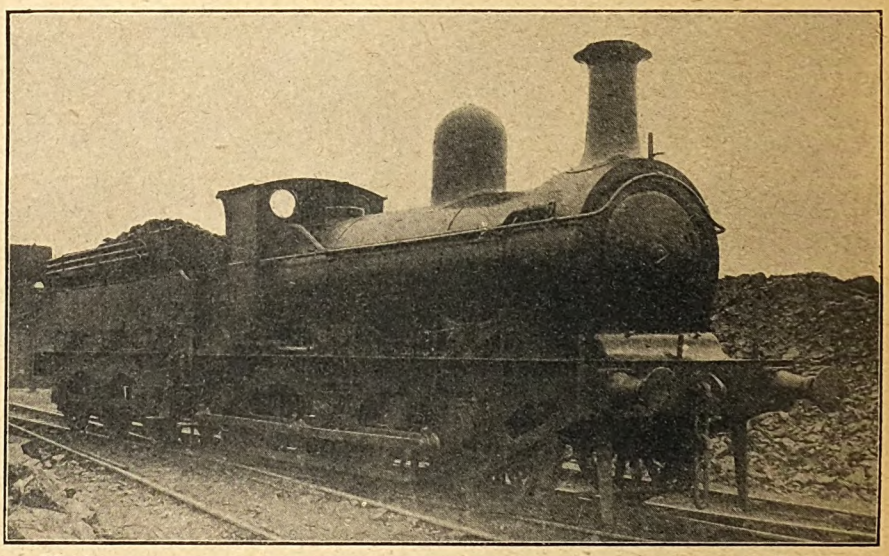
I considered the run behind *Purdon Viccars* quite an achievement at the time when I described it in the July issue of last year, but it is outclassed completely by Bailey's exploit, in all respects except the start from Wycombe, where *Purdon Viccars* benefited by a load lighter to the extent of 40 tons.

After Woodford we took things rather more modestly, although even then some startling times were recorded. The 14·1 miles from Woodford to Rugby occupied 15½ min. start-to-stop, speed being sustained at 83·3 m.p.h. on the 1 in 176 descent beyond Catesby tunnel. Finally, the 19·9 miles from Rugby to Leicester were run start-to-stop in 19 min. 35 sec.—well under "even time"—the *average* speed for the 8·6 miles from Ashby to Leicester Goods Junction being 80·4 m.p.h., and the maximum 85 m.p.h.! In the space of 70 miles, therefore, a rate of 80 m.p.h. had been attained or exceeded no less than five distinct times! At Leicester we lost the services of *Sir Edward Fraser*, and Bailey as well, attaching instead the large superheater 4–6–0 No. 428, *City of Liverpool*, but the performance, though smart in certain particulars, was not remarkable. The start was its best feature, Rothley, 5 miles, being passed in 7 min. 10 sec., and Loughborough, 9·8 miles, in 11 min. 20 sec.—the latter town being passed at 75 m.p.h. After dropping to 55 m.p.h. on the 2 miles at 1 in 176 up to Barnston, the ensuing descent to Ruddington was taken very easily, with no higher rate than 72 m.p.h.; thus Ruddington, 19 miles, was passed in 19 min. 50 sec., and Nottingham, 23·4 miles, was reached in 25 min. 10 sec. practically as booked.

Later in the same week, however, I had some opportunity of recording what these vast machines can do. Coming up on the 3.25 p.m. *ex*-Sheffield behind the pioneer engine—No. 423, *Sir Sam Fay*—with a load of 145 tons, we passed Heath, 17·9 miles, in 23¾ min. despite the steeply adverse grades, but were then stopped dead for a minute at Holm Wood on account of a "local" ahead of us shunting at Pilsley, where also we were checked by signal. Nevertheless, Nottingham was reached in 50 min. 10 sec.—only 70 sec. over schedule time. But it was after Nottingham, with a load increased to 210 tons, that the six-coupled engine displayed its prowess, making faster times, indeed, than I have ever previously recorded on this section, when running south. The start was tremendously rapid, and although the first 6¼ miles undulate moderately with no tendency in favour of south-bound trains, we accelerated to a sustained 69 m.p.h., and passed Ruddington, 4·4 miles, in 6 min. 10 sec. Up the 4-miles' ascent to Barnston, mainly at 1 in 176, we did not drop below



Photo] [*P. F. Cooke.*

GREAT CENTRAL RAILWAY.

No. 466 0–6–0 double-framed goods engine as rebuilt by Mr. Robinson. This engine was recently illustrated in its original condition.

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58·5 m.p.h., and a maximum of 75 was attained on the succeeding descent to Loughborough. So East Leake, 9 miles, was passed in 10 min. 20 sec, and Loughborough, 13·6 miles, in 14 min. 25 sec. Good work followed on the succeeding climb of 6¼ miles, speed falling only to 57·7 m.p.h. at Rothley and 55 at Belgrave; in this way Rothley, 18·4 miles, was passed in 19 min. 10 sec.; Belgrave, 21·4 miles, in 22 min. 5 sec.; and but for a prolonged signal check past Abbey Lane box, we should comfortably have covered the 23·4 miles from Nottingham to Leicester in 24 min. 55 sec., start-to-stop, instead of the 26 min. allowed. A day or two afterwards I noted something still finer, behind the same engine, on the 9.23 p.m. from Sheffield to Manchester (the through Bristol express). With five 8-wheelers and one 12-wheeler—170 tons in all—we started very moderately from Sheffield, but from Wadsley Bridge, where the engine was very perceptibly given more steam, we accelerated in the space of some 9 miles from 34·6 to 50·5 m.p.h., and this entirely on an adverse grade of from 1 in 120 to 1 in 132. All my records had thus gone "by the board," and we were still accelerating appreciably when prolonged whistling heralded an almost dead stand for signals at Barnsley Junction, east of Penistone. This was very hard luck, and the run was thereby spoilt from my point of view, although we still contrived to reach Guide Bridge in less than a minute over the 49 min. scheduled.

Returning, however, to my journey on the 3.25 p.m. from Sheffield to London, at Leicester I was surprised and pleased to see *Sir Edward Fraser* backing on to the train, and in the opening run to Woodford my anticipations were not disappointed, as the work that Bailey got out of his engine was again wonderful. The start from Leicester is level or slightly undulating for about 4 miles, and on this stretch a speed of exactly 60 m.p.h. was attained. From there we breasted the continuous 1 in 176 of Ashby bank—over 6½ miles in length—at an absolutely unvarying rate of 55 m.p.h., maintained for mile after mile, passing Whetstone, 4·7 miles, in 6¾ min., and Ashby, 9·2 miles, in 11 min. 40 sec. Lutterworth, 13·1 miles from the start, was passed in 15¾ min., speed rising on the brief 1¾ miles' descent at this point to 72·5 m.p.h. while the 3 subsequent miles down at 1 in 176 produced a maximum rate of 81·8 m.p.h. On the ascending 2 miles to Rugby speed fell to 69·2 m.p.h., and the initial 19·9 miles to that town had been covered in the remarkable time of 21¼ min. The descending mile after Rugby and the level stretch beyond elicited a maximum of 75 m.p.h., Braunston, 24·6 miles, being passed in 25 min. 10 sec., and we then went grandly up Catesby bank—6½ miles of unbroken 1 in 176—speed not falling below 56·3 m.p.h. until we entered the tunnel, but dropping to 51 as we passed Charwelton—31·6 miles in 32 min. 25 sec. from the start. A brief spurt at 62·5 m.p.h. brought us into Woodford 35 min. 25 sec. after leaving Leicester, the time allowed being 38 min., and the distance exactly 34 miles. Seeing that the grades are mainly—indeed, almost entirely—adverse, and that the vertical rise to be surmounted in this short distance totals no less than 480 ft. (over 14 miles of it alone are up at 1 in 176), such a feat as this with 210 tons was indeed a notable one, and fully up to the level of that I had enjoyed on the down journey two days before.

Unfortunately, all arrears of time had now been regained, and there was, therefore, no further need to hurry. The undulating 9·8 miles from Woodford to Brackley were covered smartly in 11 min. 40 sec., start-to-stop, and after a halt of 40 sec. duration, we made a flying descent to Grendon Junction, covering the 12·5 miles from the start in 12 min. 20 sec.—under "even time"—and touching a top speed of 80·3 m.p.h. We ran so cautiously over this junction and that at Quainton Road, however, slacking also through Aylesbury, that the 8·8 miles from Grendon to Aylesbury occupied 9¾ min. But some excellent work was performed on the long and continuous 1 in 117 rise past Wendover, speed being maintained steadily at 48 m.p.h., while, after a maximum of 71·4 m.p.h. on the 3 miles' descent past Great Missenden, we only fell to 54·2 on the 1 in 160 up to Amersham. So Wendover, 26 miles from Brackley, was passed in 27¾ min.; Missenden, 30·5 miles, in 32¾ min.; and Amersham, 35·7 miles, in 37¾ min. A brisk descent followed to Rickmansworth, speed rising to 75 m.p.h., and we passed that town, at the usual very cautious rate, in 43 min. 55 sec. from Brackley—42·1 miles. Thence we ran gently into town, the 8 miles from Rickmansworth to Harrow taking 9 min. 55 sec., and the last 9·2 miles into the terminus 11 min. 35 sec., making a total of 65 min. 25 sec. for the 59·3 miles from Brackley. Needless to say, the time on the concluding stage

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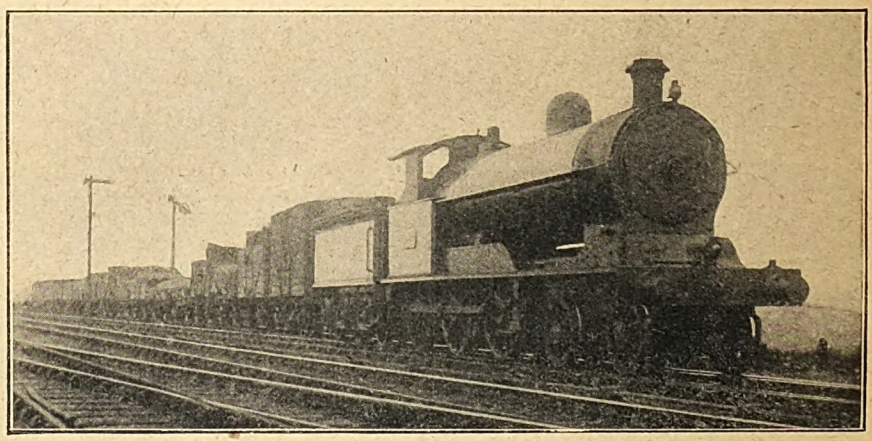
could have been cut to much finer limits than this had the train been running late; it is sufficiently significant of this run, however, to say that our arrival 1½ min. early beat all my previous records in that I have never previously reached London with this particular express exactly on time. At this point I must take leave of the Great Central Railway; indeed, as I remarked to Bailey at the conclusion of the run just described, I shall be loath to return to that line for a while, having no expectation of beating the records he has given me for some time to come!

Next to be described is a run on the Great Northern Railway, wherein the down morning "Flying Scotsman" justified its title, and afforded some times comparing rather strikingly in point of speed with those of the corresponding train from Marylebone just described. The morning East Coast Scotch expresses have, during the past winter, been run continuously in duplicate, for the first time in history, I should imagine, and the slackening of traffic in the early part of the year has led recently to quite a moderate loading. Consequently on the occasion of making this run we had only five 12-wheelers and three 8-wheelers on, weighing 267 tons empty and 280 tons with passengers and luggage; the engine was No. 1428, a standard "Atlantic" now superheated, and the driver Collarbone, who has previously afforded some evidence of a decided turn for speed. We started easily, according to Great Northern custom, even with this light load taking 20 min. 25 sec. to pass Potters Bar, 12·7 miles out, but after that we fairly "flew." The 5 falling miles from Potters Bar to Hatfield took 5 min. 5 sec., and produced a maximum rate of 74 m.p.h.; the subsequent 7·3 miles to Knebworth, including 3½ up at 1 in 200, occupied 7¼ min., the lowest speed at Woolmer Green being 56·3 m.p.h. From there we accelerated rapidly, passing Hitchin at 75 m.p.h., Three Counties at 82 (approaching Arlesey there was a faint check), Biggleswade at 75, and Sandy at 71·4 m.p.h., speed having thus been maintained wonderfully well on the but little easier than level stretch beyond Arlesey. The slight ascent at 1 in 330 to St. Neots brought us down to 64·3 m.p.h., and the equally modest descent thence to Offord produced a final "sprint" at 69·2. In this way the 6·9 miles from Knebworth to Hitchin took 6 min.; the 12·2 miles from Hitchin to Sandy 9 min. 35 sec. (average 76·3 m.p.h.); and the 14·8 miles from Sandy to Huntingdon 12 min. 55 sec.



Photo] [*C. H. Lang.*

LONDON AND NORTH WESTERN RAILWAY.

4-6-0 locomotive, No. 2600, on goods train near Stockport.

To this point some noteworthy over-all times had been made. From Potters Bar 46·2 miles had been covered in 40 min. 55 sec.; from Hatfield the time of 35¾ min. for the 41·2 miles showed a modest economy of 7¼ min. on the somewhat exaggerated schedule; from Knebworth to Huntingdon a time of 28½ min. indicated an average speed of 71·4 m.p.h. for a distance of 33·9 miles; while only 22½ min. were occupied on the Hitchin-Huntingdon length of 26·9 miles. As we were now some 3¼ min. before time, having covered the 58·9 miles from

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London in 62¼ min., it was not possible to expect much more record-breaking. Nevertheless, Stukeley bank was tackled in good style, speed not falling below 52 m.p.h. in the ascent of its 3 miles at 1 in 200, and we passed Abbots Ripton, 63·5 miles, in 67 min. 10 sec. from London. Unchecked, we could easily have been through Peterborough in 79 min., despite the sluggish commencement of the run, but a prolonged permanent way check beyond Ripton increased the time to 81 min. 20 sec., although leaving us still over 3½ min. ahead of time. Thereafter an easy ascent to Stoke sufficed to bring us into Grantham in 119 min. 5 sec. from King's Cross, all but a minute early. On the second stage of the run there is not much scope for speed exploits, when the relief express is running, as the main train is not due in York until 1.46 p.m., having thus 101 min. allowed for the 82·7 miles from Grantham. Nevertheless, a small "Atlantic," whose number I did not catch, passed Newark, 14·6 miles, in 16 min. 10 sec.; Retford, 33·1 miles, in 36 min.; and Doncaster, 50·5 miles, in 55 min. 35 sec.; thenceforward adverse signals delayed us continuously all the way to York.

As we have now reached North Eastern territory, it is fitting that at this stage I should mention one or two recent runs on the so-called "Fastest Train in the British Empire," the 1.9 p.m. from Darlington to York, allowed 43 min. for its journey of 44⅛ miles. Needless to say, such an appellation applies merely to its schedule time, which the happy accident of an almost perfectly level main line renders possible, as there are other trains in the Kingdom—such as those whose performance has just been described—which have to maintain similarly high speeds over equally long distances. Nevertheless a run on this express never fails of interest if time be kept. The first run was a curious one, a "spare" R class engine replacing the customary "Atlantic" on account of the temporary failure of the latter. An unusually sluggish start was made, speed not rising above 55·6 m.p.h. even on the favourable grades beyond Eryholme, but I fancy the difficulty must have been water, as we "bucked up" wonderfully after passing Wiske Moor troughs; in any case, however, a deficiency of all but 4 min. at Northallerton left no hope of effecting a punctual arrival. Speed rose to 75 m.p.h. before Thirsk, only fell to 72·5 at Sessay, and then mounted gradually to 76·3 at Alne. When steam was shut off at Poppleton Junction we were still doing 72·5 m.p.h., and the average of all but 73 m.p.h. for 21 miles on the level was a very creditable showing for an engine of this size, power and age. No. 2 is an average modern journey behind one of the large 3-cylinder superheater "Atlantics," several of which are now stationed at Heaton for the purpose of working this train. The start was not enterprising, but we touched 70·3 m.p.h. at Danby Wiske, and then, after falling to 67 at Northallerton, reached and sustained 75 before Thirsk. Thenceforward, the fluctuations were slight, the lowest rate at Sessay being 71·4, and the highest at Alne 76·3 m.p.h. For the details of run 3 I am indebted to a Newcastle friend, and its correspondence with the times of run 2 is really extraordinary. Indeed, from Eryholme to Pilmoor, nearly 23 miles, there is no variation greater than 5 sec. in the times, and for the first 35 miles from the start nothing greater than 10 sec. From Alne onwards, however, No. 2200 kept up a rate of 75 m.p.h. till well past Beningbrough, and so gradually drew away from No. 2203.

Columns 4, 5 and 6 give details of some previous "classic" runs for purposes of comparison. No. 4 is still, so far as I know, the record for the "course," and was timed by Mr. R. J. Purves about five years ago, the driver being Watson. The feature of this run was its amazing start, considering the type of engine employed, a speed of 67 m.p.h. being attained in the first 2½ level miles from the start, and increased to 69·2 on the 2½ miles up, averaging 1 in 366 thence to Eryholme. After that the highest speeds were 78·2 m.p.h. approaching Thirsk, and 76·2 at Alne. As will be seen from the table, however, the times of this run from Otterington to Beningbrough are beaten in each of runs 3, 5 and 6. No. 5 was the run I made behind No. 1207 immediately after that engine had been superheated, with a very light load, and is noteworthy chiefly by reason of the tremendous speed run in the latter part of the journey. A rate of 77·5 m.p.h. was obtained approaching Thirsk, but this was eclipsed by the maximum of 80·3, which was maintained for some distance in the neighbourhood of Beningbrough. I described No. 6 run in these columns as recently as August last, and this was the first I had made on the train behind a Z class engine. The effect of the permanent way check at Wiske Moor was felt until after Otterington, but from Thirsk to Beningbrough the fastest work of the whole series

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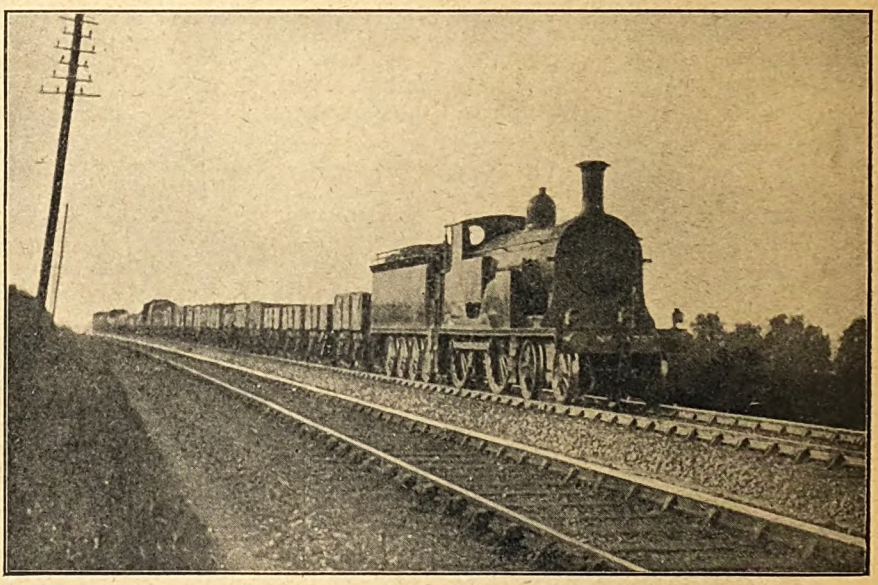
was performed, speed rising to a sustained 79 m.p.h. at Alne. No. 7 is a run of really surprising merit that I made some time ago on the up day "Scotsman," and turned up recently; it is really worth reproducing again in this connection. The large R1 4–4–0 type of the North Eastern Railway are capable of as fine work as any engines that company possesses, when carefully handled, and this is a superb example of their achievements with heavy loads. Such a sustained average as 67½ m.p.h. for a distance of nearly 36 miles—from Cowton to Poppleton Junction—is a record that would want a good deal of beating with a 4–4–0 engine hauling 365 tons, seeing that the road is barely easier than level throughout.

As a final *bonne bouche* I have reserved the account of a superlative example of Great Western Railway performance that I was fortunate enough to enjoy on a recent expedition to Bristol. The train was the 11.5 a.m. *ex*-Paddington, and the day of the week being Monday the load was unusually substantial, consisting as it did of seven 70-ft. corridor coaches, including diner, one each elliptical and clerestory corridors, and a bogie brake-van for Bristol, together with three elliptical 60-ft. 8-wheelers to be slipped at Bath. Empty weight of these 13 vehicles was 398 tons, and full at least 420 tons, as the train was very crowded; the load amounted to 52 axles, or, according to Great Western reckoning, which attributes 10 wheels to every 70-ft. coach, 59 axles. No light undertaking was therefore before the 4-cylinder 4–6–0 *Knight Templar*, No. 4019, to haul this substantial train over the 118½ miles to Bristol in the even space of 2 hours. The task was further added to in that we were badly checked by the widening works between Westbourne Park and Acton, and thereby lost 2 min. right at the commencement of the run. So we did not attain the mile-a-minute rate until passing Hayes, 11 miles out, but then steadily accelerated to 64·3 at West Drayton, 66·1 at Langley, and a maximum of 69·2 m.p.h. at Slough. After this speed fell off by degrees, getting down to 68·1 m.p.h. at Taplow, 66·1 at Maidenhead, and a minimum of 65·2 in Sonning cutting, but as we approached Reading the maximum of 69·2 m.p.h. was again attained and maintained unbroken thence for fully 8 miles on the level until we reached Goring troughs. With such a load as 420 tons this was really striking work. Thus Southall, 9 miles, was passed in 14 min. 5 sec.; Slough, 18½ miles, in 23¼ min.; Maidenhead, 24¼ miles, in 28 min. 25 sec.; Reading, 36 miles, in 39 min. 5 sec.; Goring, 44¾ miles, in 46 min. 50 sec., and Didcot, 53 miles, in 54



Photo] [*W. L. Kenning.*

UP SPECIAL GOODS TRAIN NEAR RADLEY (G.W.R.)

London and South Western Railway 4–4–0 locomotive, No. 701.

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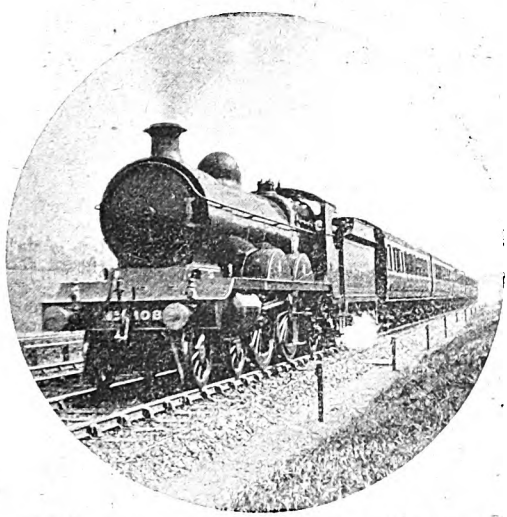
min. 20 sec. In order to arrive at net times 2 min. should be deducted from all these figures, so that "even time" had virtually been attained immediately after passing Goring.

On reaching Didcot the speed had fallen to 64·3 m.p.h., but this rate was steadily maintained up the faint ascent at 1 in 754 beyond, and continued so to Wantage Road, after which there was a brief relapse to 62·5 m.p.h. So, after passing Wantage Road, 60½ miles, in 61 min. 5 sec., and Uffington, 66½ miles, in 66 min. 55 sec., we succeeded in attaining "even time" from the start exactly at the 72nd mile-post. From here the rate fluctuated between 64·3 and 66·1 m.p.h. until we reached the head of Dauntsey bank, the brief descent of which—1½ miles at 1 in 100—yielded an acceleration to 76·3 m.p.h. Swindon, 77¼ miles, was passed in 76 min. 50 sec.; Wootton Bassett, 83 miles, in 82 min. 5 sec.; Dauntsey, 87¾ miles, in 86¼ min.; and the 93rd mile-post was breasted at full speed in 90 min. 50 sec. from the start, when we were suddenly pulled up by signal as we approached Chippenham. This was a grievous delay, as we crawled from signal to signal until the line was clear, and lost our opportunity of making a punctual run. Recovering slowly up the 1 in 660 to Corsham, we entered the Box Tunnel at 50 m.p.h., and left it at 72·5, afterwards accelerating to 75 at Bathampton, but the approach to Bath was one of prolonged caution, and we did not pass through the station until 108¼ min. after leaving London, the distance being 106¾ miles. Relieved of 90 tons, *Knight Templar* then spurted finely, accelerating in the space of 2 miles to 60 m.p.h., after 4½ to 65·2 at Saltford, and after 7 miles—all practically on the level—to 70·3 m.p.h. at Keynsham. Approaching St. Anne's Park we were again very drastically slowed—by signal, I believe—and, although we passed that station, 116¾ miles from London, in 118 min. 20 sec., the running beyond was so funereal that it took exactly 122 min. to complete the 118½ miles' journey to Bristol. Reckoning, however, that 2 min. were lost by the initial and 1 min. by the concluding delays, and that the vexatious check right through Chippenham cost 4 min. —a modest estimate—the net time works out at 115 min. With a train-load such as this, the time of 76¾ min. for the 84 miles from Southall to mile-post 93 was really astounding, involving as it did an average speed throughout of 65·7 m.p.h. Here I must draw my remarks to a close, but I think enough evidence has been adduced from my recent experiences—without by any means exhausting the material available—to prove that, whatever changes circumstances may effect in time tables and trains, the traditions of British locomotive performance remain, and will still continue to remain, unaltered.



Photo] [*F. W. Curtis.*

GREAT CENTRAL RAILWAY.

3.15 p.m. "Sheffield Special," 4-4-2 engine, No. 1082.

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Locomotive and Train Working in the latter part of the 19th Century.

THE GREAT WESTERN RAILWAY (Standard Gauge). [No. III.]

By E. L. AHRONS, M.I.Mech.E., M.I.Loco.E.

(*Continued from page* 266, *April* RAILWAY MAGAZINE.)

IN general my experience of the express engines of the 'eighties has often made me think that, although considerably smaller and less powerful than those of to-day, they still had a considerable margin of power over and above what they were usually called upon to exert. This remark applies not only to the Great Western 7 ft. singles, but to the engines of the Midland, London and North Western and other railways; for many of the same engines were, ten to fifteen years later, called upon to take considerably heavier loads at higher speeds, and in nearly all cases did the work well.

An excellent instance in point is that of Great Western Railway engine 162 *Cobham*, which, under the charge of driver Hughes, made in the late 'nineties some really excellent runs on one of the Paddington–Birmingham non-stop expresses. The distance of 129 miles 25 chains was booked to be covered in 2 hours 27 min., a speed of 52·7 miles per hour. On one occasion, with a load of 160 tons, the train was stopped twice by signals, and was badly slackened six times, but nevertheless reached Birmingham in 138 min. 9 sec., nearly nine minutes under time. The actual running time exclusive of stops was 132 min. 8 sec., and the net time allowing for all delays was 123½ min. The celebrated performances of No. 162 on this train took place during the period when I was abroad, and for the above notes I was indebted to the late Mr. Rous-Marten.

On another occasion during this later period the same observer recorded a run by one of the old 7 ft. singles from Birmingham to Leamington, 23¼ miles, in 25 min. 3 sec. with seven corridor coaches, a running average of 55·8 miles per hour. The maximum speed down the Hatton bank was 77·5 miles per hour. Leaving Leamington, on the non-stop run to London, Oxford, 42½ miles, was passed in 46 min. 10 sec. from the start, although this involved the fairly long climb up the Harbery bank to Fenny Compton. When the Worcester service was much improved, and one train ran from Paddington to Worcester, 120½ miles, in 136 min., the 1116 class 7 ft. singles occasionally took their turn on this train, although it was usually allotted to Mr. Dean's 7 ft. 8 in. bogie singles.

This class, Nos. 3001 to 3080, came upon the scene during the last eight years of the 19th century, and for a considerable time did the bulk of the express work between London and the West of England, besides taking a big share in the running of the North trains between London and Wolverhampton. They are so well known—or rather were, for I regret to say that hardly any remain at work—that further description is unnecessary beyond stating that they had 19 in. by 24 in. cylinders and 160 lbs. pressure. The first thirty were built as 2–2–2 singles, without bogies, and the latter were subsequently added from 1894 onwards. As many of their performances were given by the late Mr. Rous-Marten in the earlier numbers of the RAILWAY MAGAZINE, I will content myself with one instance on the then 9.30 a.m. express from Paddington, which ran through to Birmingham without stopping. The engine was *Britannia* No. 3005 and the load 160 tons. Reading (36 miles) was passed in 39 min. 32 sec. from the dead start, Didcot East Junction (52¾ miles) in 57 min. 47 sec., Oxford (63½ miles) dead slow in 69 min. 3 sec. At Wolvercote Junction (66¼ miles) we were pulled up dead by signals in 72 min. 50 sec. from the start, and had to stand exactly 2 min. Starting again, at

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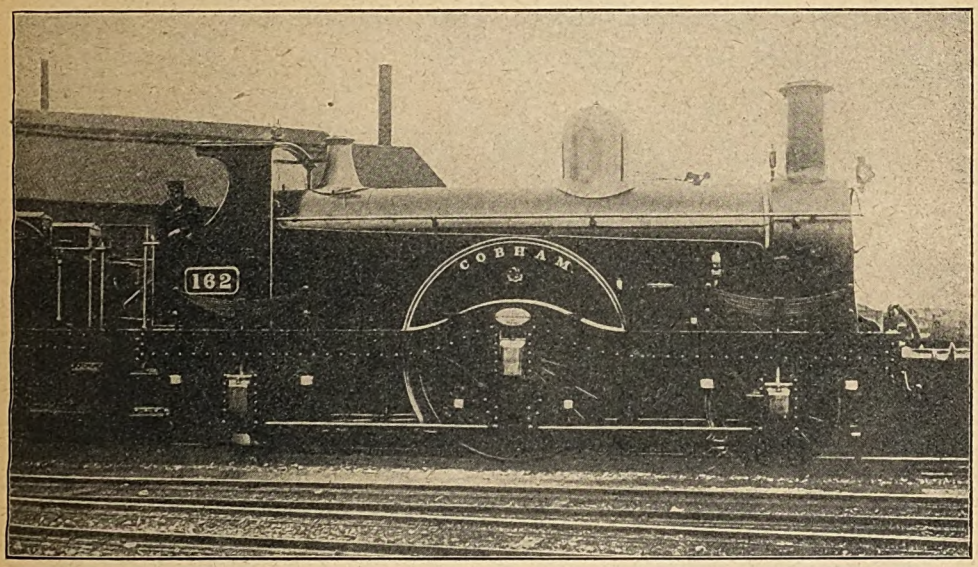
74 min. 50 sec. from Paddington, Banbury (86¼ miles) was passed at 99 min. 7 sec. The maximum speed down the Harbery bank did not exceed 70·6 miles per hour and we passed Leamington (106 miles) dead slow in 119 min. 10 sec., Warwick (108 miles) in 122 min. 36 sec., the 113th post at the top of the Hatton bank in 128 min. 44 sec. and stopped at Birmingham in 146 min. 50 sec. Time would have been kept but for the signal stop at Wolvercote Junction, for although we took 1 min. 8 sec. more than the booked time to Oxford, the run from passing Banbury to Birmingham was done in 1 min. 7 sec. under the time allowed.

Having dealt with the express engines at London and Wolverhampton, something may be added of those stationed at Swindon, which worked between there and London. First of all there were the celebrated 6 ft. 6 in. singles Nos. 69 to 76 with 17 in. by 24 in. cylinders. I intend to mention these more fully later in connection with the South Wales trains, and merely add that until the spring of 1887, when they were removed from Swindon, they worked two turns daily to Paddington. On the up journeys they worked the old 7.5 a.m. and 11.15 a.m. slow trains from Swindon, but on one of the return down runs they had charge of the 12.0 noon South Wales express, a train which had through coaches for everywhere and was consequently rather too heavy for them, as it frequently loaded up to 180 to 200 tons. For the reason that the main line trains had become too heavy, and also because it was considered desirable to shorten the hours of the Gloucester men, Nos. 73 to 76 were transferred to the latter place and Nos. 1122 and 1123 sent to Swindon. The two latter engines, together with the single engines Nos. 9 and 10, afterwards performed Swindon–London work for a good many years.

Engine No. 9 was unique. Originally it had been built in 1881 as a 4–2–4 side tank express engine, with 7 ft. 8 in. single drivers and a bogie at each end, after the pattern of the celebrated Bristol and Exeter tank engines. But No. 9 also had other peculiarities. The bogies were of the "Mansell" wood centre pattern, the side tanks extended the full length of the engine to the smokebox, and the boiler was of the domeless variety, to which Mr. Dean was partial during the years 1881 to 1883.



Photo] [*Loco. Publishing Co., Ltd.*

NO. 162, *Cobham*, AS EARLY REBUILT.

The above No. 9 was but a ghostly visitor. What it did and the things that happened to it I do not know from personal knowledge, but I was given to understand that on its trial trips it had a little way of leaving the rails just at the particular moment when it ought to have remained on them. There used also to be a story current at Swindon that the late Sir Daniel Gooch, then Chairman of the Great Western Railway, did not like the long side tanks. The engine did very little work and finally, in 1884, a No 9 which was almost entirely new took its

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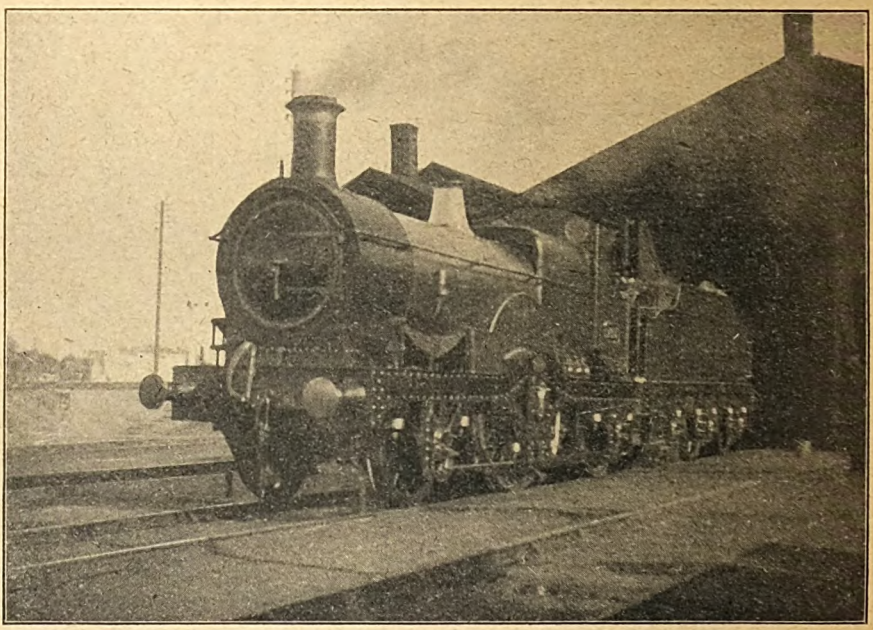
place. This was a 2–2–2 "single" tender engine with 7 ft. 8 in. drivers, 18 in. by 26 in. cylinders, and 150 lbs. pressure. The bearings of the driving wheels were inside only. The boiler was a new one, with large brass dome near the chimney, and had 1,250 sq. ft. of heating surface, of which the firebox provided 130 sq. ft. The other general dimensions were :—Carrying wheels, 4 ft. 6 in. diameter ; total wheel base, 18 ft. ; and weight in working order, 36 tons, of which 15 tons rested on the driving wheels. But the peculiarity was in the valve gear. The valves were placed on the top of the cylinders and worked by long rocking shafts, which extended to the outside, these in turn being worked by eccentrics placed outside on the boss of the driving axle. For some time No. 9 ran slow trains between Swindon and Bristol, but some two years after it was built it was put to work the main line London expresses. At first it broke several rocking shafts, but after these had been strengthened, the trouble from this source ceased.

I had considerable experience with No. 9, for I fired on her for some time. She was a very powerful engine and would pull like a coupled engine, but in spite of her 7 ft. 8 in. wheels she could not run as fast as either the 7 ft. "Queen" class or even the 6 ft. 6 in. 69 to 76 class. In 1887 she was re-boilered, and the flush smokebox altered to a raised one, and in 1890 was completely renewed as an inside cylinder double-framed engine with 7 ft. wheels, so that having an 1887 boiler, and everything else completely new in 1890, there was virtually nothing left of the 1884 engine. A few years later she was given the name *Victoria*, and was for a long time afterwards stationed in London.

No. 10, built in 1886, was also a 7 ft. 8 in. single, originally of a totally different design to No. 9. No. 10 had double frames, and the valves were underneath the cylinders, so that they could be driven direct from eccentrics on the crank axle in the usual manner. The cylinders, 18 in. by 26 in., and the carrying wheels, 4 ft. 6 in. diameter, were of the same size as in No. 9 ; but the wheel base of No. 10 was 18 ft. 3 in. The boiler was slightly larger and had 1,291½ sq. ft. of heating surface, and the weight was 41 tons, of which 16½ tons rested on the driving wheels. No. 10 was on the whole a better engine than No. 9, being equally powerful, but a freer and faster runner. Nevertheless in 1890 it was converted to a 7 ft. single, similar to the altered No. 9, and a few years afterwards was named *Royal Albert*.



Photo] [*K. A. C. R. Nunn.*

ONE OF THE LAST TWO OF THE 2-2-2 "SINGLES," NO. 165.

Taken at Oxford in 1914. This engine is now "scrapped."

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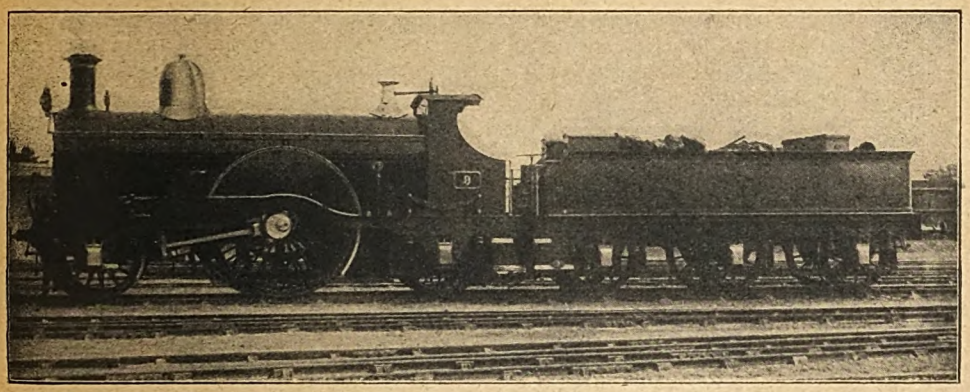
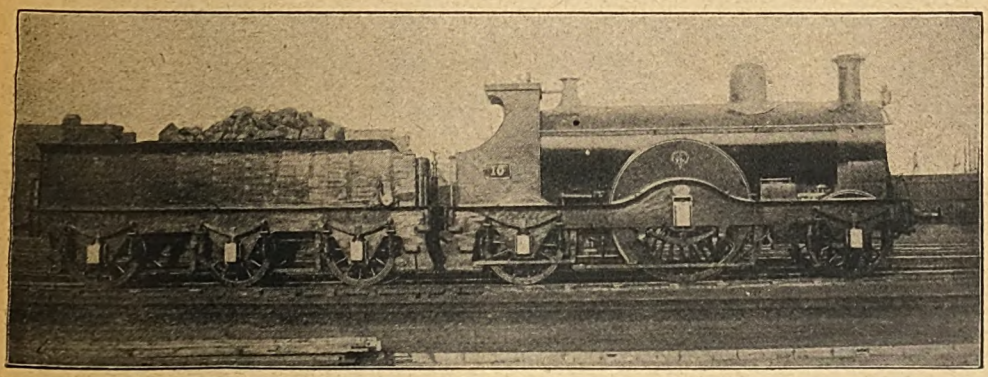


NO. 9, 2-2-2 SINGLE LOCOMOTIVE.
7 ft. 8 in. driving wheels; cylinders, 18 in. × 26 in.

I had also a large number of journeys on the footplate of No. 10 in her 7 ft. 8 in. days, generally with the 5.45 p.m. down South Wales express, on which, though a heavy train of 180 and sometimes 200 tons, she generally kept good time. But I have no records of the performances of either of the above engines, for unfortunately these were accidentally destroyed during my absence abroad.

In the spring of 1887 the two Gloucester engines, 1122 *Beaconsfield* and 1123 *Salisbury*, were transferred to Swindon. The Gloucester drivers who had run the up Milford boat express (8.0 a.m. from Gloucester) through to London for many years, were given engines Nos. 73 to 76 and came off at Swindon, where they handed the train over to Swindon engines Nos. 9 and 10. Nos. 1122 and 1123 stood spare at Swindon, but nevertheless were frequently on their old train. This train, which left Swindon at 9.5 a.m., was also combined with a Bristol express and this load was about 160 and frequently up to 180 tons. But the Great Western Railway of those days was nothing if not economical in train mileage, so they also utilised this heavy important express as a West of England milk train, and at Swindon a tail was added to it consisting of six large milk vans.

Now the Great Western Railway milk van was not the milk van of other companies, *i.e.*, a moderate-sized four-wheeled vehicle. The Great Western Railway variety was a long six-wheeled arrangement like a prison on wheels; it was intended to hold milk churns and plenty of them and succeeded admirably. I should think the weight of one of those vans loaded with churns was at least 16 tons. Nearly every cow in the West of England contributed its quota to the load of the 9.5 a.m. up, and 250 to 260 tons was the weight with which the train had to try to keep time. The allowance for the 41¼ miles



2-2-2 ENGINE NO. 10, BUILT AT SWINDON, 1886.
Driving wheels, 7 ft. 8 in.; cylinders, 18 in. × 26 in.

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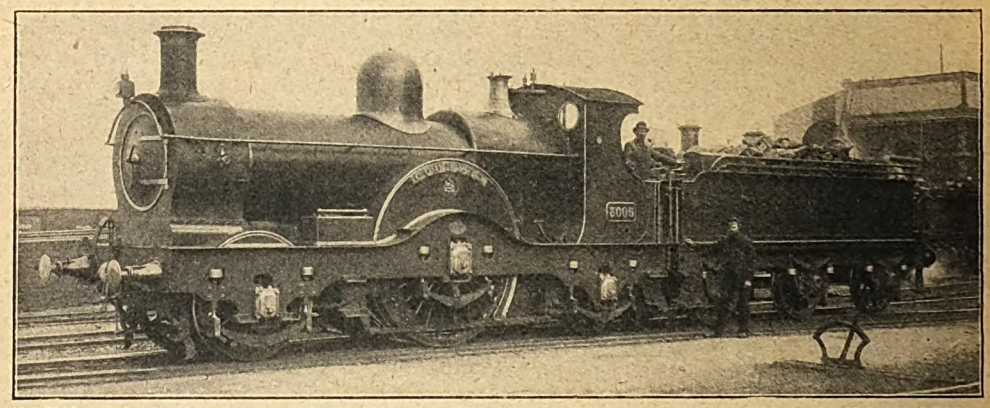
from Swindon to Reading was 50 min., and this had to include time lost for a slack through Didcot to about 25 miles per hour. It was really hard work, and though time could be kept in fine weather, there were many occasions when a minute or sometimes even two minutes were dropped to Reading. Moreover, a point not to be forgotten is that the engines were not fitted with steam sanding apparatus, but had to be content with the old form of dry sand boxes.

On one unfortunate occasion the engine was No. 1123 *Salisbury*, and the month being October, the leaves were falling rapidly. On running into one of the cuttings overshadowed by trees near Pangbourne (there were then only two, not, as now, four roads) we suddenly came on to a long stretch of track the rails of which were literally covered with dead leaves. No. 1123 immediately started slipping, and nothing could stop it, while the regulator was open, so that our speed was reduced to a crawl. Only frequent visits with a bucket of sand to the buffer plank saved us from being pulled up altogether, and as it was we were eight minutes to the bad at Reading.

Whether the above occurrence brought matters to a climax, I do not know, but a few days later when we pulled up at Paddington platform, we were met by a young gentleman from the Paddington offices, who was armed with a brand new note-book opened ready at page one, and a pencil the point of which he was vigorously sucking. "Driver," he said, removing the pencil, "this train is frequently late, and there have been several complaints about it, so that I have been instructed to come down each morning to look into it." Driver M——, who was a most conscientious and painstaking individual, did not like this, and having made some remarks about the excessive weight of the train and the strong wind, left it at that. The next morning—engine No. 9 this time—we had dropped one minute to Reading, but made it up between Reading and London. On this occasion our new friend interviewed the guard first, and the latter had booked the minute lost, but had had no time to "square up" against the minute regained. When he turned up at the front for the engineman's explanations, driver M—— could hardly contain himself for wrath, and lest he should say something better left unsaid, he handed the matter over to me. I walked our friend down to the tail of the train, went carefully into the weight of the milk vans, estimated a 270 ton load for the whole train, and finally concluded with a forcible and convincing description of the excessively lactic qualities of the Wessex cow. Whether this last argument ever found its way into the Great Western Railway archives at Paddington I do not know, but although no immediate alteration took place, the locomotive department succeeded in time in convincing the powers that were that perhaps after all the milk vans might form a train of their own. The eventual result was that a new special milk train left Swindon at 9.10 a.m. and made a through run to London, where it arrived at 10.55 a.m. Incidentally this shows that the milk trade has always been well catered for on the Great Western Railway.



Photo] [*Loco. Publishing Co., Ltd.*

NO. 3006, *Courier*, AS ORIGINALLY BUILT IN 1892.

The London local train services were very similar to what many of them still are, in so far as the use of the old standard 2–4–0 side

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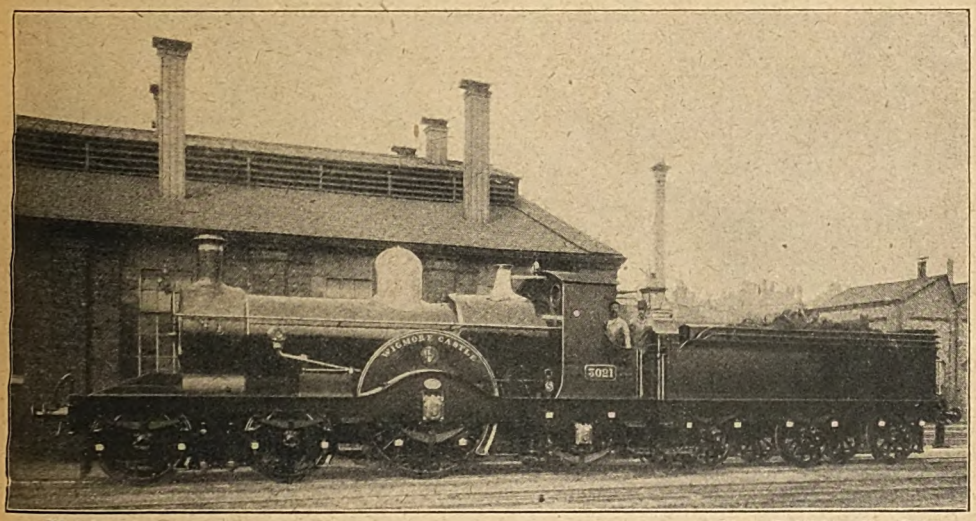
tank engines is concerned. These were stationed at Westbourne Park, Southall, Slough, and Reading. There are not so many now at work in the London district, for the faster Reading locals are now run by the large 4–4–2 "County" tank engines, and the Kensington, Hammersmith and Metropolitan lines have since been electrified. The first forty of the 2–4–0 tank engines originally had inside frames to all wheels, *e.g.*, No. 627, but when subsequently rebuilt in 1887 to 1891 were altered to have the Great Western Railway standard pattern of outside axle-boxes for the leading wheels. The class was constructed between 1869 and 1899, and there were finally 140 of them, all with 5 ft. wheels and 16 in. by 24 in. cylinders. They did excellent work and some very fast running on the local trains. They were essentially Southern division engines, and it was not until well within the present century that I ever saw one in the Birmingham district or Northern division.

In 1887 Mr. Dean designed and built at Swindon an entirely new type of "Metropolitan" tank engines. These were side tanks of the 0–4–2 pattern with double sandwich frames and outside cranks. Only three of them, Nos. 3521 to 3523, were fitted with condensing apparatus for Metropolitan tunnel traffic, and they had only a short existence in the London district. Two or three were stationed at Reading for the Basingstoke branch. They had "chain hung" trailing spring gear, and such a marked lateral wobble at the back that they were shortly afterwards converted to 0–4–4 tank engines and sent into the West of England.

The goods train service does not require any detailed description. The most famous of the standard gauge goods trains was the 10.45 p.m. London to Exeter, which was always known as the "Flying Pig." Unlike the average pig, it kept a fairly straight course down the main line, and also ran at a very good speed. The origin of the nickname, like that of the 10.15 p.m. Broad Gauge "Tip," is unknown to me, but no driver, guard, signalman or shunter ever made mention of the 10.45 p.m. Exeter goods, but always referred to the "Pig."

Having introduced readers of the RAILWAY MAGAZINE to this animal, perhaps I may also be pardoned for a further digression into the domain of natural history. The subject is crows.



Photo] [*Loco. Publishing Co., Ltd.*

NO. 3021, *Wigmore Castle*, MODIFIED BY ADDITION OF BOGIE.

The crow is essentially a railway bird, and frequents embankments and cuttings indiscriminately, but is particularly partial to the "four-foot." What the crow did with himself or how he spent his time in the days before George Stephenson constructed railways I do not know, and the books on ornithology make no mention of it either, but it is to be presumed that he loafed round somewhere. The appearance of railways gave him an object in life and something to think about. An express train will frequently run against and kill various other kinds of birds, but it rarely hits a crow. He will frequently be seen to fly

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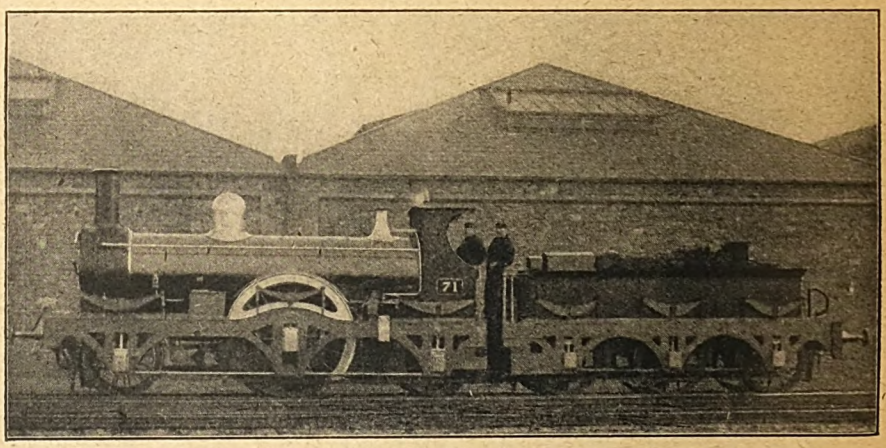
lazily across just in front of the engine, but is always careful to leave just sufficient clearance between his trailing end and the corner of the engine smokebox, even if only a bare sixteenth of an inch.

Having frequently noticed this, I became somewhat interested in the railway crow, and made enquiries of engine drivers with whom I was firing. They said that the crow was after the grease and oil that is always to be found on the line, and implied that a crow would sell his soul for railway grease. Moreover, I was also informed that he is such a wily bird that he knows all about the trains, even to the extent of time-table alterations—hence the impossibility of hitting him with a smokebox front. I am not so sure that the crow has as good a time on the railway to-day as he had formerly since wagon axleboxes, which used to be filled from the top with what was to him that great delicacy yellow grease, are now often provided with totally enclosed oil wells with sponge pads. Crows were always to be seen hopping about under the wheels of stationary wagons in sidings, and in this connection an incident may be recalled which bears out the views of the engine drivers quoted above. A number of empty wagons for the West had accumulated in the sidings at Didcot, and after a few days, an engine and van were sent to clear them out to Swindon. The train of empties started out, but at Challow was pulled up by the signalman, who reported sparks coming from several hot axles. An examination was made of the train, which resulted in the discovery that on several wagons on which the axlebox lids were loose and easily lifted, the crows had eaten out the yellow grease. The marks of their feet were plainly visible and the lids of several axleboxes were in an upright position. I hasten to add that I do not give this incident as the reason for the abandonment of the old grease axleboxes in favour of the closed oil well type.

The subject of crows naturally brings up that of insects. There were a number of stopping "pick-up" goods trains on the Great Western known amongst the staff as "flies," a name which I never heard applied on any other railway. One such example was the "Didcot fly," which crawled between that station and Swindon, did much shunting at all places where shunting could possibly be done, and took about 12 hours or more for the 24-mile journey. I have no speed records for this train.



NO. 71, 6 FT. 6 IN. SINGLE ENGINE (69–76 CLASS), BUILT AT WOLVERHAMPTON, 1872–1875.

Cylinders, 17 in. × 24 in.

The station which until recently did duty at Reading was a survival of an old type to be found in former years in various parts of the country. Gloucester was another example, and also the old Lancashire and Yorkshire station at Huddersfield. There was only one side, a single long platform, which served for both up and down trains. Cambridge, Great Eastern Railway, is the most notable example still surviving. The up and down main lines, which passed through in front of the station, were each connected with the one platform line by means of a double scissors crossing, so that an up train to London which stopped at the platform had to cross the down main line

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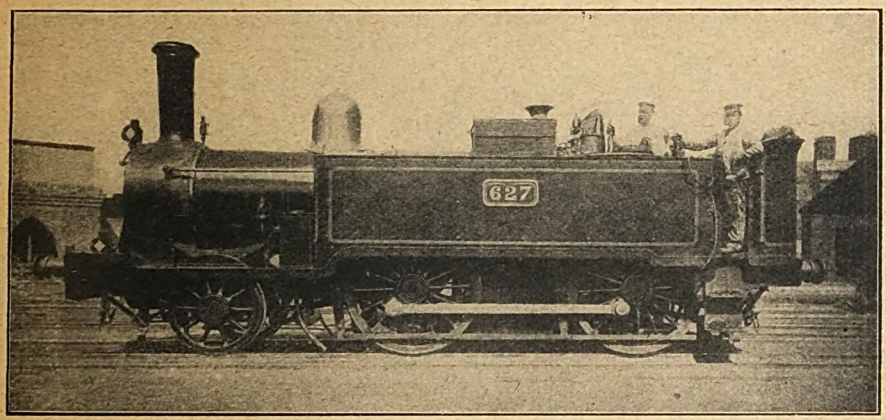


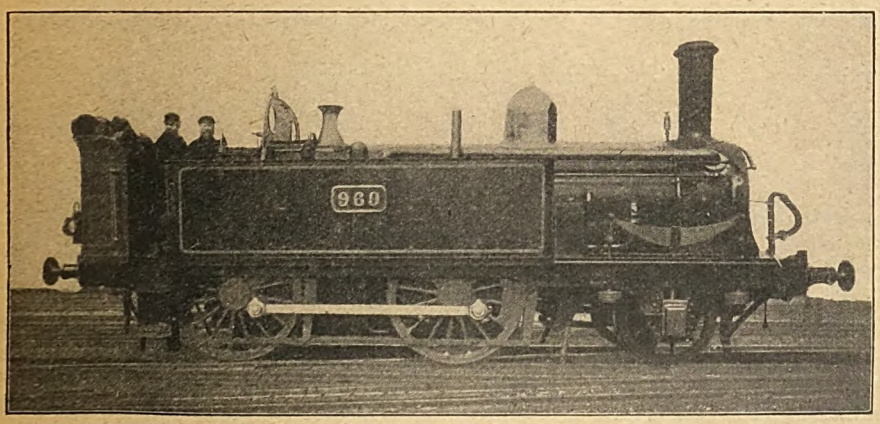
Photo] [*R. H. Bleasdale.*

2-4-0 TANK ENGINE NO. 627, AS ORIGINALLY BUILT.
Coupled wheels, 5 ft. diam. ; cylinders, 16 in × 24 in.

twice, first on entering and again on leaving the station. The signalling interlocking was consequently somewhat complicated, but I never heard of any accident occurring at any of these stations.

The line from Reading to Trowbridge, the "Berks and Hants," as it is called, now forms for a considerable part of its length the new and shorter main line to the West of England. Formerly it was merely a local country line, much of it single, which served Newbury, Hungerford and Devizes. The engines used on this section were of the 481 class 2-4-0 type, with inside frames to all wheels. The coupled wheels were 6 ft., and the cylinders 16 in. by 24 in. There were seventeen in the Southern division, Nos. 54, 481 to 490, and 587 to 592, and they were mostly stationed at Trowbridge and Bristol, with two or three at Reading and two at Salisbury. Connecting with the "Berks and Hants" service at Trowbridge, was another cross-country slow train service between Bristol and Salisbury, through Bath and Trowbridge. The 481 class, which worked the whole of these services, was afterwards rebuilt with 17 in. by 24 in. cylinders, when the engines were considerably enlarged, and in their rebuilt state they will be mentioned later. Some of them remained on the above services after they had been rebuilt.

The line between Chippenham and Weymouth, known as the "Wilts and Somerset," which also connected with the "Berks and Hants" at Holt Junction, near Trowbridge, was partly worked by 6 ft. 6 in. coupled engines from the Swindon end. But most of the trains were run to Swindon by the



2-4-0 TANK ENGINE NO. 969.
Designed by Mr. Joseph Armstrong and built at Swindon, 1874.
Coupled wheels, 5 ft. diam. ; cylinders, 16 in. × 24 in.

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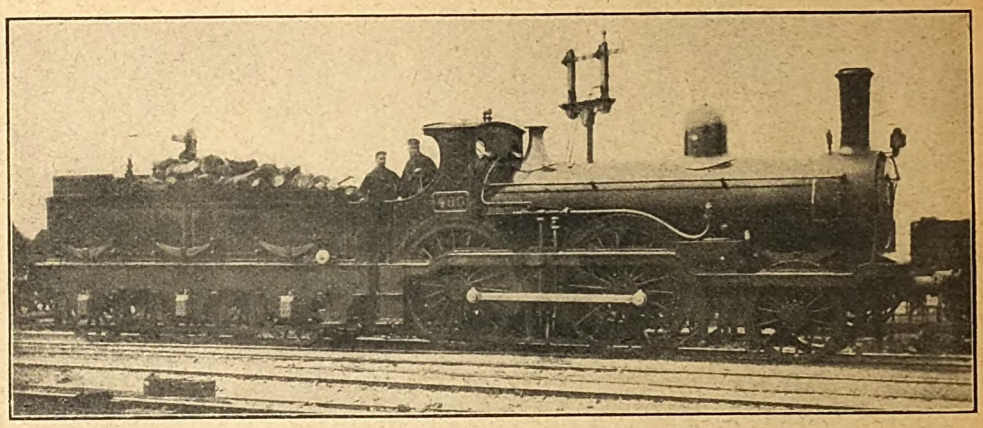
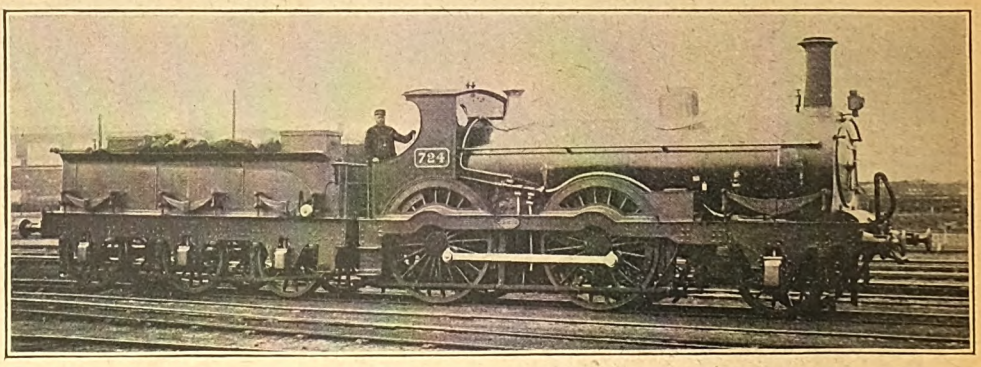


2-4-0 ENGINE NO. 490 (481 CLASS), BUILT AT SWINDON, 1869.
Coupled wheels, 6 ft. diam.; cylinders, 16 in. × 24 in.

five 2-4-0 Weymouth engines Nos. 56, 717, 719, 720 and 724, which had 6 ft. wheels and 17 in by 24 in. cylinders. There were no trains which could be called express, the best being the 3.25 p.m. from Weymouth, which reached Swindon at 6.20 p.m.—91½ miles. All the fast trains stopped at the principal intermediate stations, Dorchester, Yeovil, Frome, Westbury, Trowbridge and Chippenham. The loads were usually six or seven six-wheeled coaches. The fast trains had one eight-wheeled through coach to or from Paddington.

Mention of the "Berks and Hants" and "Wilts and Somerset" lines brings me round once more to natural history. This time the subject is pheasants.

The pheasant is a very different sort of bird from a crow, not only in outward appearance, but also in his mental outlook. He hasn't the same adaptability for railway matters, and being somewhat of a fool he generally manages to get in the way, when he ought to be somewhere else. For this reason he sometimes flies into telegraph wires or gets hit by the front of an express engine, but as the Board of Trade inspectors do not hold enquiries into this sort of accident, he goes on doing it. Moreover, his easy-going habits make him so easily poached that he leads people astray who would otherwise be good citizens. There was once a pheasant on the "Wilts and Somerset" line that did this to a friend of mine, whom I will call K——, who was at the time firing on the engine of a slow goods train. Between two certain stations, which I will call A and Z, there is a very stiff bank, up which, when approaching the summit, a fully loaded goods train can only proceed at a crawl of some four or five miles an hour. I have not named the exact locality, but many Great Western Railway men will probably recognise it, for at the particular spot the railway



2-4-0 LOCOMOTIVE, No. 724 (SERIES 717-726), BUILT AT SWINDON IN 1872.
Coupled wheels, 6 ft. diam.; cylinders, 17 in. × 24 in.

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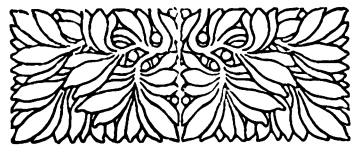
passes through a thick wood, which in the late 'eighties was full of pheasants of an exceeding tameness. I very much doubt whether guns ever shot over it at that time, with the result that all the pheasants in the county made it a rendezvous, and the population increased so rapidly that they appeared to average a density of some four or five to the square yard. If one of them turned round he generally hit the bird behind him in the eye with his tail. One fine afternoon one of the crowd found that he had not sufficient "elbow-room," and decided to climb the fence and explore the railway, just as the slow goods was approaching up the bank. He was evidently so accustomed to trains that he hardly budged, and I regret to have to add that when the engine came alongside, a well-planted shot with a lump of Welsh coal hit him in the abdomen, a portion of his anatomy which the driver termed his "firebox." To quote Bret Harte under somewhat similar circumstances, "the subsequent proceedings interested him no more," for it took but a moment, at the slow speed at which the train was moving, for K—— to descend from the engine and fetch the bird on to the footplate, where the driver executed a "danse macabre" by performing on him with the fire-shovel, and he was promptly stowed away inside the toolbox. Then the trouble started. As K—— afterwards phrased it in telling the story, "Have you ever had a conscience that thumped like a bad big-end brass? You see my father is a J.P., with decided views as to the ownership of pheasants. I began to feel so uncomfortable that I completely missed the firehole with the next shovelful of coal, and when I scattered it all over the footplate, the driver made some very pungent observations. It was too late to put the bird back, so I offered it to the driver, who declined it with thanks. I believe that after the first excitement was over, he too began to feel uncertain as to the merits of our performance. But he excused his refusal by stating that his missus positively turned sick at the smell of game, and it was as much as he was worth to take it home with him. Had it only been a turkey the case would have been different." But it wasn't, and so eventually the bird arrived at Swindon, where it was smuggled out of the shed to K——'s rooms. K—— had been a public schoolboy, and certain of the history of the Middle Ages occurred to him, chiefly, as he put it, that part where the ancient barons used to go crusading or marauding or doing something that they ought not to have done, and then presenting the proceeds—when they departed this life—to the Church. It was a happy thought and provided a means of "taking up the brasses" of his conscience, so he packed up the bird and sent it round with a polite note to one of the curates, without any unnecessary comments as to its origin. K—— said "All's well that ends well, but I don't mean to have any further truck with railway pheasants."

In case the owner of the wood should see these lines, I will add that the incident occurred more than 25 years ago, and probably all the other pheasants are also dead by this time.



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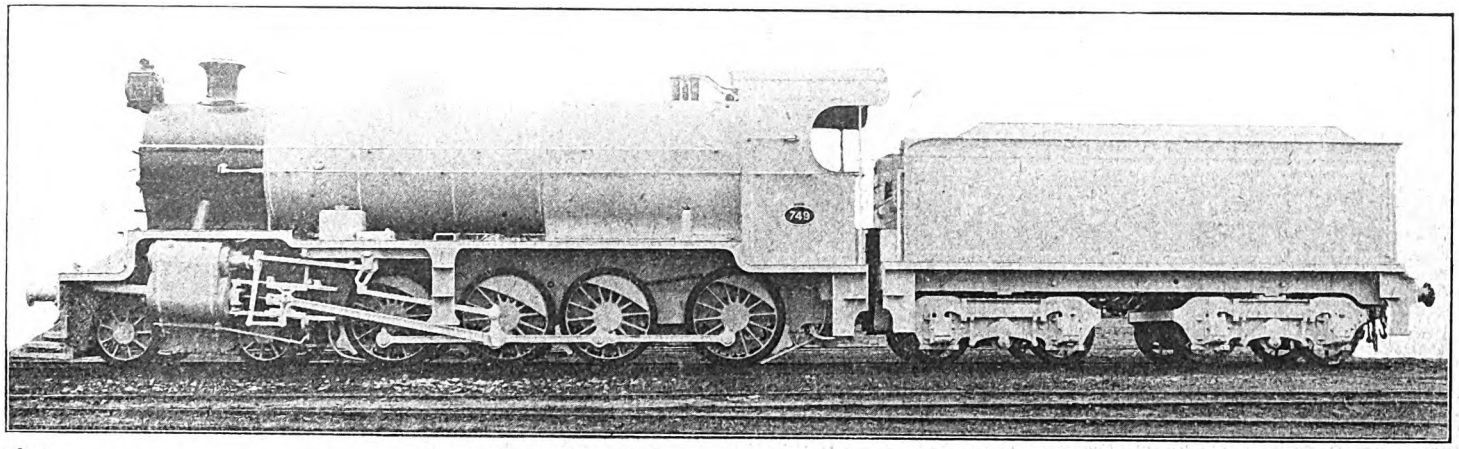
4-8-0 SUPERHEATER LOCOMOTIVE: CENTRAL ARGENTINE RAILWAY.

Designed by Mr. J. P. Crouch, Chief Mechanical Engineer.
Built by the North British Locomotive Co., Ltd.

THE first of these engines is illustrated, the design initiating the 4-8-0 wheel arrangement on the Central Argentine Railway. Equipment includes "Robinson" superheater and Walschaert valve gear, automatic pressure release valves on the cylinders, automatic vacuum brake on both engine and tender, mechanical lubricators, self-lifting injectors, and "Servo" regulator. The engines are simple expansion, and the most powerful main line locomotives yet adopted by this railway. The firebox is of Belpaire type. Since being handed over to traffic working the locomotives have given every satisfaction. Leading dimensions are as follows:—



Cylinders	21 in. dia. × 26 in. stroke
Diameter of coupled wheels	4 ft. 7½ in.
Diameter of bogie wheel	3 ft. 2 in.
Fixed wheel base	16 ft. 0½ in.
Total wheel base (engine)	28 ft. 4 in.
Working pressure	160 lb. per sq. in.
Heating surface, tubes (water contact)	1,557 sq. ft.
Heating surface, superheater elements (fire contact)	460 sq. ft.
Heating surface, firebox (water contact)	189 sq. ft.
Total heating surface	2,206 sq. ft.
Grate area	325 sq. ft.
Total weight (engine) loaded	78 tons 19 cwt. 3 qr.
Total weight (tender) ,,	60 ,, 8 ,, 0 ,,
Total weight (engine and tender) ,,	139 ,, 7 ,, 3 ,,
Gauge	5 ft. 6 in.

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Railway Electrical Progress and Practice.

AN ALL-ELECTRIC MAIN LINE RAILWAY OF THE FUTURE. [No. I.]

By "INDICATOR."

PROPHECY is admittedly a thankless task, for however well advised and qualified one may be to indulge in "intelligent anticipation" there arises almost invariably some new factor which could not be foreseen and yet materially modifies at least part, if not the whole, value such attempts to study and forecast the trend and outcome of development may possess. With this understanding, and in view of the increasing importance which the subject of main line electric traction is realising in all parts of the world, also with due regard to the delaying influences, as regards the home railway situation, of the present European war, it is thought that an attempt to foreshadow probable developments would be of interest and possibly benefit, even under existing conditions.

Briefly, the following article is written as by an ordinary railway journalist of the period 1935-1940, as a description of a railway of considerable traffic importance, having to work trains of all kinds and meet all classes of industrial needs, and which is supposed to have realised the distinction of being the first to complete electrification equipment so as to permit of all traffic being worked thereby.

It is probably too much to expect that any of our very large railways should be able to realise complete electrification within the period of 20-25 years suggested, and therefore the railway selected is taken as one of considerable magnitude, but yet secondary in size and extent not only to lines such as the London and North Western, Great Western, Midland and North Eastern, but also to railways comparable with the Great Northern, Great Eastern, and Lancashire and Yorkshire.

The railway, to which the title of the "Rayhampton, Marsden and Belmont" is given was, however, schemed out for another purpose, but is taken as thus draughted with the idea that the usual tendency of futurist writers to adapt their schemes to suit their purposes should be mitigated, if not avoided altogether. As suggested this railway provides for a heavy local traffic in the Rayhampton area; in the Marsden district are included a group of towns associated with it somewhat in the same way as Wolverhampton, Walsall and Dudley are located with reference to Birmingham; while Belmont and its coast branches may be regarded as analogous with Norwich and the Cromer, Yarmouth and Lowestoft routes therefrom.

Associations with other lines are included, as well as certain problems likely to arise from this cause; but it is well to explain that while electrification aspects necessarily receive attention, in some respects to a considerable extent, almost as much stress is laid upon engineering and traffic developments, and these will be, in the writer's opinion, at least as important as, if not more so than, the peculiarly electric problems if, and when, the whole of any railway system of general and reasonably extensive traffic magnitude comes to be electrified.

Our futurist author may now be allowed to speak for himself. He writes, obviously, in the present tense, as reviewing a completed undertaking and a railway working heavy and comprehensive traffic according to methods pointed out as he proceeds.

On February 1st the Rayhampton, Marsden and Belmont Railway introduced a special accumulator system of traction on the Topley and Eston branches, thereby displacing the last of the steam locomotives engaged in working standard traffic on its system, and in consequence the "Marsden" Company, to use the recognised abbreviation by which it is known, claims the distinction of being the first railway of considerable size to work all traffic electrically. It is true that some of its neighbours have even

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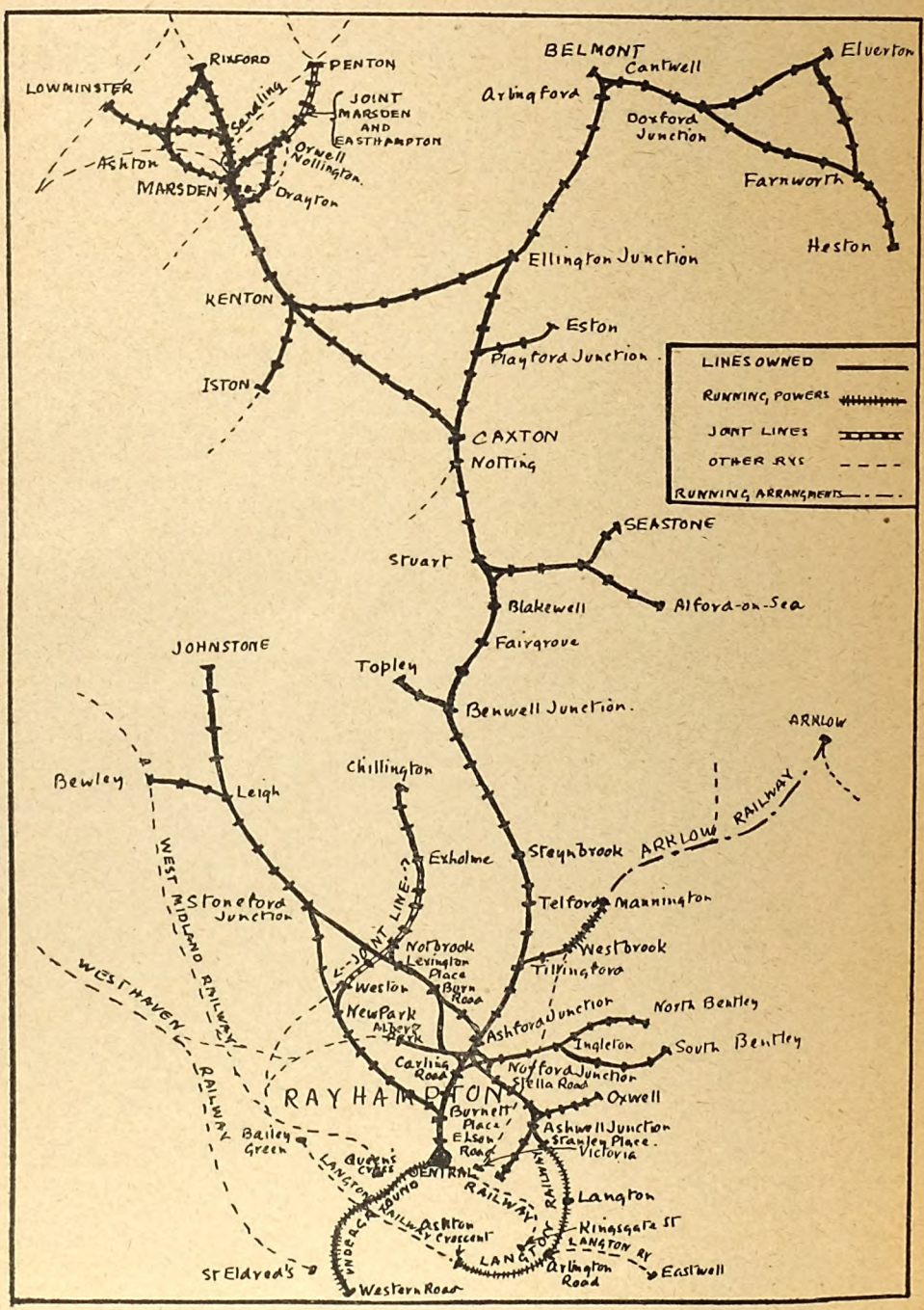

GENERAL MAP OF THE RAYHAMPTON, MARSDEN AND BELMONT RAILWAY SYSTEM.

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greater mileages of electrically equipped track, and convey heavier volumes of traffic by such means. But all of them have yet a good way to go before their steam locomotives can be entirely displaced, and in many instances there are still long sections of main line which must be operated by steam for several years to come; whereas the Marsden Railway has now effectively and actually realised the ideal which has influenced its Board of Directors for the last twelve or fifteen years, and is at last a truly "all-electric" railway, dealing with all kinds of traffic, and that on a very considerable scale, by means of electric traction.

For the benefit of readers not familiar with the Marsden system, the general features of the districts served may be outlined. Rayhampton, where are the headquarters of the railway company, is in the central districts mainly commercial, but to the north and east is a busy industrial area of a general character, with at Oxwell and near North and South Bentley access to riverside premises and docks. The inner suburban area of Rayhampton proper extends approximately as far as Tillingford, on the main line, and to Notbrook and New Park on the western lines; but the actual limits of ordinary suburban traffic are Mannington, Steynbrook, Exholme (the extension to Chillington—mainly through pastoral country—was built by the Marsden Company, the West Midland not being a party, though the Weston-Exholme section is joint) and Stoneford Junction. There is a degree of residential traffic right out to Benwell Junction and Topley, and to Leigh, Johnstone and Bewley, while over the Arklow Railway a series of expresses are operated by the Marsden Company from Central station as a result of an early compensating agreement, though these are not allowed to do intermediate work on the Arklow system and goods traffic is performed entirely by the owning company. These Marsden-operated Arklow expresses have developed a considerable and high-class residential traffic, Arklow being the nearest coast resort to Rayhampton.

As a growing shipping centre, with extensive and modern docks, built by the Marsden Company, the port of Seastone is becoming increasingly important, while Alford-on-Sea is now a favourite coast and holiday resort. Caxton, the junction of the two northern sections is a fairly large manufacturing town, owing its prosperity to the fact that many industrial establishments have been encouraged to remove there from Rayhampton, the railway company having for a long period given special facilities and generally studied the needs and requirements of such firms.

It is, however, the Marsden area itself which is the most important from the industrial point of view. Here, within a radius of about 12 miles is a series of manufacturing towns, of which Marsden is the capital, though on the southern boundary of this area. It includes Rixford, Penton and Lowminster, besides several towns served by railways other than the Rayhampton, Marsden and Belmont. Kenton is comparable with Caxton, but is rather larger and more akin, as regards its industries, to Marsden, to which it is, in some respects, a manufacturing offshoot. Iston is an inland resort in considerable favour for residence with Kenton and Marsden business men.

On the eastern lines Belmont is concerned largely with general manufactures, while Farnworth is a shipping port and centre for holiday traffic. Heston is headquarters of a considerable fishing industry, while Elverton is growing as a high-class holiday and coast resort.

The general features of the traffic catered for by the Marsden Company, apart from the Rayhampton district facilities, which will be separately considered, are thus:

PASSENGER.

(1). Through expresses for the north, between Rayhampton, Marsden and Rixford, handed over at the latter town to the Northern Railway. Operated with joint rolling stock.

(2). The famous Rayhampton - Marsden hourly expresses, serving also Rixford, Penton and Lowminster, for which the Marsden Company has derived so high a reputation. The traffic conveyed by these trains is largely of a commercial character.

(3). The Rayhampton-Belmont expresses, with which are combined in many instances the principal Seastone and Alford services.

(4). Iston-Marsden and Belmont-Kenton-Marsden expresses.

(5). Local services on all routes in the Marsden area.

(6). The eastern lines from Belmont, largely served by through portions of Rayhampton and Marsden trains continued to Elverton or Heston.

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(7). Intermediate main line facilities, amplifying the Seastone and Alford connections, and serving Caxton and Kenton, in addition to such facilities as are given by a number of the through expresses.

(8). The Topley and Eston branch services.

GOODS, MINERALS, ETC.

(*a*). Dock and industrial traffic in the Rayhampton area.

(*b*). Through goods traffic between Rayhampton and all parts of the system.

(*c*). Shipping traffic from Seastone.

(*d*). Fish traffic from Heston and shipping and like traffic to and from Farnworth.

(*e*). Coal and industrial traffic from the Marsden area to the Rayhampton dock-serving sections, to Seastone (here mineral traffic is a very big factor) and to some extent to Farnworth.

(*f*). Also special local facilities as required to serve the northern coal and industrial area.

(*g*). The general goods, cattle, agricultural and other traffic incidental to a railway of the character noted.

So far the particulars given would apply equally whatever system of traction were adopted, but they serve to show that the Rayhampton, Marsden and Belmont Railway does indeed operate traffic on a basis sufficiently extensive and comprehensive to merit attention being specially directed to it as the first example of a truly "all-electric" railway, and it is now necessary to make a few remarks as to the electrical development.

Twenty years ago there seemed little probability that electric traction would become general on this system, mainly owing to the difficulties of standardising with other lines, but also in view of the heavy capital expenditure involved. At that time the Marsden Company had already electrified their Central-Weston line to co-operate with the West Midland in respect of the Exholme services, and the electric trains were utilised for the through trains to and from Western Road over the Underground Railway. The Oxwell branch had also been equipped to enable Langton tube trains to work through *viâ* the Stanley Place—Ashwell Junction connecting line.

But even this limited working involved several variations of practice, while the prospective electrification of the whole of the Arklow Railway on another system, added a fourth factor to be considered. For a commencement the 650 volt direct current third rail system on the Oxwell branch, the 600 volt direct current system of the Underground where third and fourth rails were employed, and the 1,200 volt d.c. third rail system of the Exholme joint line were correlated (1) by operating the Oxwell branch entirely by through-running Langton trains (passengers from Osborn Street changed at Ashwell Junction, an increased service partially compensating for this inconvenience); (2) by equipping the Central-Weston line similarly to the West Midland system, from which, in fact, current was for a time obtained; and (3) by installing on the connecting lines at Central station from and to the Underground, a change-over equipment for the collectors and brushes, there being a short dead section, trigger devices amplifying the motorman's change-over appliances to ensure that no conflicting electrical connections should be made, and by enforcing automatically the working of motors in series of two on the 1,200 volt sections.

This arrangement operated satisfactorily for some time, but in view of the fact that the Arklow Railway was introducing an overhead single-phase alternating current system, and a similar method was being advocated by the Easthampton Railway in the Marsden district, with whom part of the Penton branch was jointly owned, besides being associated at several places in that area, the Directors eventually decided upon adopting the same system for general installations.

Their decision to embark upon an extensive electrification at this period was, however, influenced very largely by certain other considerations, and while their action undoubtedly exercised a strong effect upon the choice of a similar system by several other leading railways, it is well to remember that these other considerations were, at the time, the governing factors conducing towards electrification.

Primarily the principal difficulties of the period were of a traffic nature. One factor was that, in common with other railways, tramway competition was making itself very seriously felt throughout the inner suburban districts of Rayhampton, and bade fair to make considerable inroads in certain districts a little further out. At the same time the enlargement of the Central station was becoming imperative, while additional tracks virtually all the way from Central to Ashford Junction were

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RAYHAMPTON, MARSDEN AND BELMONT RAILWAY.

Thirty-Seven

EXPRESS ELECTRIC TRAINS

For BUSINESS MEN

Run every Weekday

BETWEEN

RAYHAMPTON (Central Station)

AND

MARSDEN (North Square),

MANY WITH

BUFFET SALOONS,

AS UNDER :—

				CD	AD	AD	B	BD	AD		BD	CD	CD	AD	CD	CD	C	C	C
Rayhampton (Central) ..	dep.	a.m. 5.15	a.m. 6.40	a.m. 8.0	a.m. 9.0	a.m. 10.10	a.m. 11.0	n'n 12.0	p.m. 1.0	p.m. 1.30	p.m. 2.30	p.m. 3.30	p.m. 4.30	p.m. 5.30	p.m. 6.20	p.m. 7.40	p.m. 9.0	p.m. 10.30	mid. 12.0
Marsden (North Sq.) ..	arr.	a.m. 6.45	a.m. 8.5	a.m. 9.20	a.m. 10.10	a.m. 11.20	p.m. 12.15	p.m. 1.15	p.m. 2.10	p.m. 3.55	p.m. 3.45	p.m. 4.50	p.m. 5.50	p.m. 6.40	p.m. 7.40	p.m. 9.0	p.m. 10.20	p.m. 11.50	a.m. 1.20

		A	C	CD	AD	D	D	C	D	AD	CD	C	CD	AD	CD	CD	C	CD	C	
Marsden (North Sq.) ..	dep.	a.m. 5.20	a.m. 6.30	a.m 7.30	a.m. 8.30	a.m. 9.15	a.m. 10.0	a.m. 11.0	n'n 12.0	p.m. 1.0	p.m. 2.0	p.m. 3.0	p.m. 4.0	p.m. 5.0	p.m. 5.40	p.m. 6.20	p.m. 7.40	p.m. 9.0	p.m. 10.30	mid. 12.0
Rayhampton (Central)	arr.	a.m. 7.30	a.m. 7.50	a.m. 8.50	a.m. 9.40	a.m. 10.40	a.m. 11.10	p.m 12.20	p.m. 1.25	p.m. 2.10	p.m. 3.20	p.m. 4.20	p.m. 5.20	p.m. 6.10	p.m. 7.0	p.m. 7.40	p.m. 9.0	p.m. 10.20	p.m. 11.50	a.m. 1.25

A—Non-stop trains. B—Call at Kenton only. C—Call at Caxton and Kenton only. D—Buffet saloons.

MOST OF THESE TRAINS ALSO INCLUDE THROUGH PORTIONS BETWEEN RAYHAMPTON AND RIXFORD, PENTON AND LOWMINSTER.

NOTE.—Passengers between Rayhampton and Marsden and Rixford are not allowed to travel by through Northern trains, except in the case of the 5.15 a.m. and 12 midnight trains from Rayhampton and the 5.20 a.m. and 12 midnight trains from Marsden.

Text of poster issued to advertise the approximately hourly service of express trains between Rayhampton and Marsden.

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urgently demanded. Electrification, while partially overcoming these difficulties, would, however, be only a partial amelioration of the goods traffic problems which were almost as acute as those of the passenger traffic.

As a result, while proceeding with electrification, but on a limited scale, important engineering works were first undertaken, and as it was realised that heavy expenditure could not be avoided, unless much of the suburban traffic were to be sacrificed altogether, it was decided, instead of enlarging the Central station and widening the approaches, (1) to erect a new structure over the existing lines from outside Central station to Burnett Place ; (2) to sectionalise the terminus and introduce an almost universal system of standard passenger trains ; (3) to provide for entirely independent goods lines between Ashford Junction and the principal goods depôt at Moortown, adjacent to Elson Road station ; and (4) to construct comprehensive systems of flying and burrowing junctions at Burnett Place and between Carling Road, Stella Road, Ashford Junction and Norford Junction stations. The cost of these would be heavy, but not more so seeing that the enlargement of Central station, and the proposed widenings would entail still greater expense, especially in conjunction with other works partially equivalent to those embodied in the scheme actually realised, and which would also have to be undertaken whatever course were adopted.

The scheme decided upon was completed some eight years ago, and will be described in due course. Therefore, for present purposes it will be sufficient to mention that Central station is now operated virtually in three distinct sections, devoted respectively to the western routes (with which trains to and from the Underground are mainly associated), the main line services and the eastern and main line local services. Immediately outside the terminus all three down lines rise to an upper structure built over the older lines, which are utilised to provide corresponding up roads. From Moortown goods depôt there are two independent goods lines on the lower level, and at Burnett Place there is a complete system of non-fouling passenger line connections between the "western route" up and down lines and the fast lines, with distinct goods connections. Onwards to Carling Road there are four passenger lines and two goods lines, and between Carling Road, Stella Road, Ashford Junction and Norford Junction is an elaborate system of interconnecting and non-fouling connections, with the goods lines kept separate in nearly all respects, though they have surface junctions. Beyond Ashford Junction goods trains can be worked over either the fast or slow roads, there being four-track equipment as far as Steynbrook.

Meanwhile progress was being made with the electrification of the whole of the suburban area, and as, by suitably changing over tracks during the stages of the work, the western lines could be taken in hand they were equipped to enable trains to be worked on these routes. As the single-phase trains could be worked over the direct current lines of the Underground Railway an early step was to introduce the single-phase system in replacement of that originally employed, analogous direct-current working occurring also on the joint section between Weston and Exholme.

This was in due course followed by the equipment of the New Park-Stoneford Junction section, and as it was realised that some time must elapse before the routes *viâ* Carling Road could be adapted, the electrical installation was then extended right through to Johnstone. As this section entailed the working of trains by electric locomotives hauling ordinary rolling stock, with a proportion of high speed traffic, it provided valuable experience, and it is an open secret that the success there obtained materially influenced the decision of the Directors to proceed with the still more ambitious schemes now consummated.

The next step was to equip the main line local tracks as far as Tillingford and then along the branch to Westbrook to join the Arklow Railway which, equipped on the same system, allowed of continuing to Mannington with the electric trains, though as all the Central-Arklow trains were fast it was not practicable to run them over the Marsden Company's local lines, so that they continued to be worked by steam locomotives. Equipment of the main line local tracks to Telford and then to Steynbrook was next completed, and at the same time the Osborn Street line was taken in hand to Ashford Junction, together with the route *viâ* Burn Road to Stoneford Junction and the spur to Notbrook.

Nothing further was done as regards Rayhampton electrification extensions for some time, though the improvements between Central and Ashford Junction were

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by that time well in progress; but meanwhile events in the Marsden district were also calling for local electrifications. These lines were, therefore, taken in hand, until only the through express services and the goods traffic remained to be operated by steam traction.

By the time the Rayhampton improvement works were completed experience had shown that electrification had fully justified itself, and experiments with the working of goods traffic (of a general character), by similar methods on the Johnstone route, and in the Marsden area of a complicated and heavy industrial and mineral type, including much shunting, caused the directors to decide upon the comprehensive scheme of complete electrification. In due course, therefore, the fast lines from Central to Steynbrook were equipped, and the main line onwards to Marsden. Other sections followed, and at intervals during the past six years we have seen the extension of electrical equipment from Caxton to Belmont, on the Seastone and Alford branch (the former in association with the construction of the new docks at Seastone and the provision of all-electric plant there), and eventually to other sections, and to all goods lines.

The last step was to provide for the working of the Topley and Eston branches. Neither of these provided sufficient traffic to warrant complete electrification, and both are now operated by accumulator locomotives adapted to take current at Benwell Junction and Playford Junction respectively from the main line system, and to do shunting there according to ordinary methods, the transformer equipment on the locomotive being utilised for charging the accumulators, in conjunction with a special convertor also carried on the locomotive, the branch being worked through the ordinary motors on the direct current system. The two locomotives required for these branches, also one in reserve, are somewhat unweildy and expensive, but they serve their purpose very well, and have avoided the cost of equipping 12 miles of line, or the alternative of maintaining steam locomotives expressly for these services.

Details of the engineering works, electrical equipment, train services, etc., must be deferred until next month, together with consideration of other aspects, but it is necessary to mention that except on the Rayhampton purely local routes, the general practice is to work trains by means of electric locomotives hauling ordinary rolling stock requiring a minimum of adaptation, as will be set forth in due course. All routes outside the Rayhampton area are operated in the same way, motor-car sets being used only on the Central-Stoneford Junction, Exholme, Steynbrook, Mannington, and North and South Bentley routes and to and from Osborn Street station on corresponding services. The Oxwell route is now operated once again from Osborn Street, Langton tube trains terminating at Ashwell Junction.

(*To be continued.*)

TO OUR BRITISH & IRISH READERS.

We send our Magazine to Newsagents and Railway Bookstall Proprietors on approbation. They return the ones that are unsold. If they knew precisely how many were required they would order just those and no more. The returned copies are "waste"—valuable paper is lost, men's productive energy dissipated, and railway transport is hampered. You can avert this waste by ordering THE RAILWAY MAGAZINE in advance, and always of the same newsagent or bookstall manager. He will then order just enough copies for your requirements and there will be no returns. Give him an order to stand until countermanded and so practise an important national economy.

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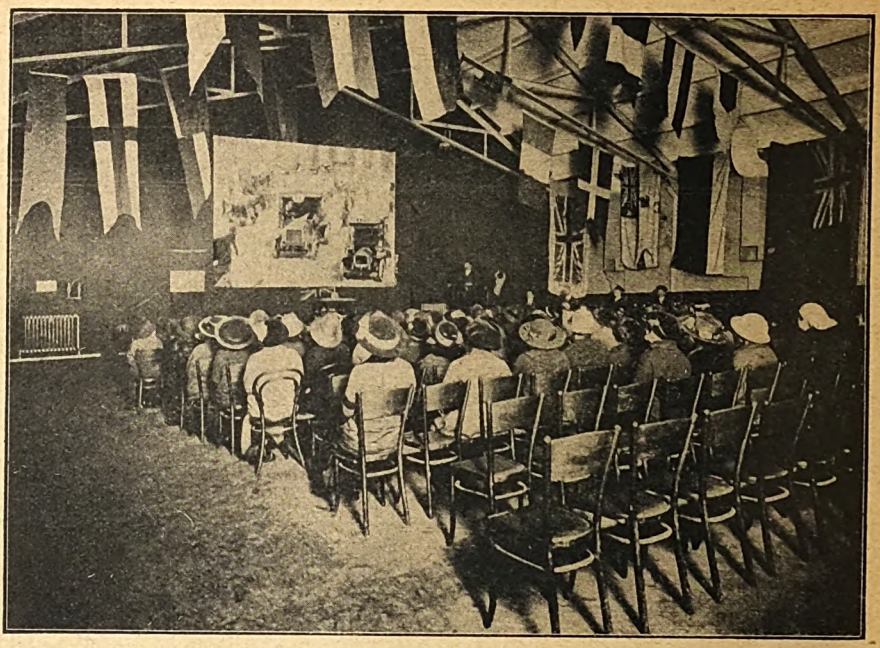

CINEMATOGRAPH THEATRE.

An instruction film is being shown to women applicants waiting their turn for examination as to fitness for service.

The Training of "London General" Omnibus Drivers and Conductors.

As one of the principal transport agencies associated with Underground Electric Railways of London Co., Ltd., no apology need be made for referring to the arrangements made for training drivers and conductors, on the basis of a visit of inspection to the Training School at Chelsea.

In regard to the former, it may be mentioned that over 2,000 "General" motor-omnibuses are engaged in working about 102 services, a number penetrating far out into the suburban districts, while a majority serve the central districts of London at some stage of the respective journeys. For these some 7,000 drivers and conductors are at present required—a large number of "General" 'buses have been taken over for Army purposes, hence the reduction from nearly 10,000—while 26 depôts are in operation, all equipped with complete garage accommodation, and with repair shops for dealing with maintenance repairs which do not require treatment at the Walthamstow workshops.

That the work of this Company provided material of considerable national value is shown by the fact that within 48 hours of the outbreak of war no fewer than 1,500 employés were called to, or joined the Colours; within a week the number had grown to 2,000, while no less than 49 per cent. of the operating staff has changed in personnel since the outbreak of war.

Notwithstanding the high percentage of new men, the changes in traffic conditions, "reduced lighting," etc., it is worthy of remark that the percentage of street accidents in which "General" 'buses are concerned was reduced in 1915 by 44 per cent. as compared with a pre-war year, and by 26 per cent. as compared with 1914, which included a period of darkened streets and reduced lighting, that year itself being a great improvement upon 1913.

Such statistics speak volumes for the careful selection and training of the drivers and conductors employed by the Company; but, in addition, the "Safety First" movement, already the subject of propaganda

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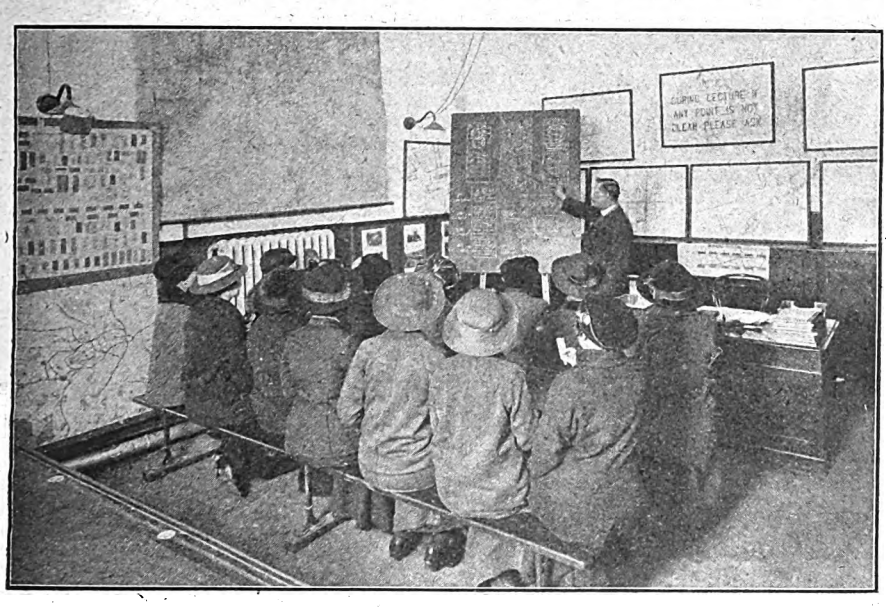
before the outbreak of war, has been even more seriously pushed since, education therein applying to the public as well as to the staff. On the public side, 'buses have recently been placarded with notices to the effect: "Is it Safe—Look First Before You Cross," and this will be followed by others; while a series of "Is it Safe" advertisements and leaflets, addressed to various classes of people, are all designed to direct public attention to their share in this desirable and now all-important matter.

The Training School is situated in Milman's Street, Chelsea, S.W. Here we were able to see all phases of training in operation, whereby drivers are prepared to pass the severe police tests which precede their going out on to the road, and conductors educated in reference to routes, fares, tickets, rules and regulations, and conduct under various emergencies which may arise. As more and more of the staff have joined the Colours, it has become necessary to introduce female conductors—"Conductorettes" they are styled—and our visit was, therefore, of further interest in that large numbers of these were then engaged in the Training School. It may be mentioned that about 120 are already in service, and numbers in training will bring the total to about 500.

Originally a stable used in connection with the horse-'bus business, the premises at Milman's Street were converted in the latter part of 1913 into a training centre for motor-'bus drivers and conductors. The area site occupies some 31,050 sq. ft., 5,396 of which comprise an open yard, in which various hazards, such as dummy refuges, pedestals, etc., are placed, these being used in connection with the training of drivers to avoid such obstacles, to reverse, etc.

The buildings comprise:—

(a) Five class rooms, in which lectures are given. In the drivers' rooms, various parts of the 'bus chassis and sections through specimen engines are exhibited, so that learners may obtain a knowledge of the mechanical equipment, and then be able to remedy breakdown defects without having to send for assistance. In the conductors' rooms operation of the punch and tickets is taught, the fare stages explained, and other parts of their duty discussed.



A CLASSROOM FOR THE TRAINING OF CONDUCTORS.

(b) The cinema hall, with seating accommodation for 400, where educational films of their work are shown to the men training, actual conditions of service working, points in connection with avoidance of accidents, etc., being clearly discussed during the lectures. Our representative attended one of these lectures, and found the films exhibited of peculiar interest and of great educational value. The hall is used, also, for social and other functions.

(c) A mess room for the provision of food at practically cost price to learners.

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TRAINING YARD AT L.G.O.C. TRAINING SCHOOL, CHELSEA.

(d) Small covered yard.
(e) Office accommodation.

Adjoining the Training School premises is the clothing store, the headquarters of the clothing department, under the control of the superintendent of employment, a competent tailor being in charge of the section, assisted by a staff of six storekeepers, clerks and tailoresses. All uniform clothing necessary for the drivers, conductors and inspectors is dealt with here, both in regard to receipt, storage, issue and record. The tailor's shop is fitted with staff and machines for dealing with minor alterations to garments. The measurements of the staff have been co-ordinated into 20 stock sizes, thus doing away with the difficulties of individual measurement of so large a number. As many as 600 men have been supplied and fitted with well-tailored suits in one day, and out of a total issue to the 10,000 men concerned, only 20 remained which required alteration.

The office accommodation includes the headquarter arrangements of the 17 Mess Rooms and Institutes, which have been instituted in connection either with the Garages or terminal points in different parts of London, where the employés have special arrangements made to enable them to purchase refreshments at practically cost price, the Company bearing the expense of accommodation, lighting, etc. At 10 of the

TAILORS' SHOP, AND UNIFORM ADAPTING ROOM.

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Mess Rooms, commodious and well-appointed Billiard and Recreation Rooms adjoin, some having seating accommodation for from 200 to 300.

The following is an outline of the procedure in connection with the engaging and training of drivers :—New drivers must be between 25 and 40 years of age. The medical examination is strict, particularly in regard to sight and hearing, and men who find it necessary to use spectacles are not accepted. The services of the most capable and experienced drivers are utilised as instructors, and these, with special learners' 'buses, are attached to the various garages.

After men have been accepted for tuition, they are allocated to Garages as near as possible to their homes, and are put through the first stages of their training at the Training School, where, contemporaneously with lectures, practical lessons are given in gear changing and general control of the vehicle. Driving instruction is first given on the school premises, and, subsequently, in quiet neighbourhoods, where there is little or no traffic. Subject to satisfactory progress, learners are then taken into streets carrying heavier traffic. After being finally tested by one of the Chief Instructors, they submit to the Scotland Yard police test, which includes an examination in a short arm reverse and actual driving through the busiest West End thoroughfares. The average time taken to train a fully competent driver is 28 days.

Conductors are not employed under 21 years of age, or less than 5 ft. in height, this minimum height being fixed by the police. No man is accepted for employment unless he is physically sound in all respects, but the medical test is not so severe as in the case of drivers. Learners are required to attend at the Training School to hear lectures on tickets, avoidance of accidents, and on general traffic work, and to see the cinematograph films. They are allocated to garages and begin their service work with an experienced conductor, in order to obtain practice in the use of the punch, tickets, handling of cash and the general duties of a conductor in actual service conditions. The average time taken to train as conductor is 14 days.

Learners, both drivers and conductors, receive a food allowance of 2s. per day whilst under tuition, this being for a maximum period of 28 days with drivers and 14 days with conductors.

Inspectors are promoted from the staff and attend at the Training School for instruction and examination in regard to their new and more important duties, particularly in connection with dealing with the public and the staff, and a knowledge of traffic observation.

During the year 1915, the School has been extensively used for training purposes outside the Company's operations, as for Army purposes, and, during the current year, large numbers of female conductors are being trained to make up for the shortage due to men enlisting with the Colours.

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British Railway Service and the War. [IV.]

THE Chairman of the Cambrian Railways Company (Col. David Davies, M.P.) is at present serving in France with his battalion (the 14th R.W.F.). Lord Kenyon is commanding the Welsh Horse Reserve, which is stationed on the East Coast. Mr. W. E. L. Jones, one of the Company's relief men on the Mid-Wales section, was mentioned in Sir Ian Hamilton's despatches in connection with the Dardanelles operations. Of the total number of the Company's staff eligible for service with His Majesty's forces about 90 per cent. have attested under Lord Derby's Scheme.

The Supplement of January 27th to the *London Gazette* contained the following:—Headquarters of Administrative Services and Departments: Deputy Director of Inland Water Transport.—(Graded for purposes of pay as an Assistant Quartermaster-General).—Temp. Lieut.-Col. G. J. Baugh, R.E., October 28th. Col. Baugh is well known as Commander Baugh, R.I.M., Marine Superintendent of the Lancashire and Yorkshire and London and North Western Railways Joint Steamers, Fleetwood.

A record is claimed by the London and North Western Railway in regard to the number of men who have joined the Colours during the present European War, the total up to March 3rd being 18,298, about one in five of the whole of the ordinary railway personnel. At the inception of the Derby Recruiting scheme there were 42,435 men of military age in the service, and of these no fewer than 32,823 presented themselves for attestation. It is not, of course, to be expected that when the groups are called up the whole of this number can be released for service with the Colours, but at the same time it must be remembered that an undertaking has been given on behalf of all the railways that every effort will be made to release as many men as possible, particularly in the case of grades which are not directly concerned in the movement of traffic.

Additions to the list of honours bestowed upon London and North Western Railway men in His Majesty's service are as follows:

Holland, G. E., Colonel, Royal Engineers. Has been made an "Officier de l'Ordre de Leopold" by the Belgian administration.

Barraclough, H. S., Sergeant, 82nd Company, Royal Engineers. Fireman, Locomotive Department, Crewe. Awarded the Distinguished Conduct Medal.

Bromage, W., Sergeant, 7th Batt. Royal Warwickshires (T.F.). Porter, Traffic Department, Nuneaton. Awarded the Distinguished Conduct Medal.

Cooper, W. H., Lance-Corporal, 3rd Batt. West Yorkshire Regt. Clerk, Goods Department, Leeds. Awarded the Distinguished Conduct Medal.

Croll, E., Lance-Corporal, 7th Batt. Sherwood Foresters (T.F.). Cleaner, Locomotive Department, Netherfield and Colwick. Commended by his commanding officer.

Mason, C. L., Temporary Lieutenant, Motor Cyclist Section, Royal Engineers, Special Reserve. Indoor Assistant, Carriage Department, Wolverton. Mentioned in despatches.

McLean, C., Lance-Corporal, Service Batt. Manchester Regt. Fitter's Apprentice, Locomotive Department, Longsight. Mentioned in despatches.

Priske, T. B., Private, 3rd Batt. King's Royal Rifle Corps. Loader, Goods Department, Broad Street. Awarded the Distinguished Conduct Medal.

Vigars, E. H., Sergeant, 19th Hussars. Under Shunter, Traffic Department, Rugby. Awarded the Distinguished Conduct Medal.

Official notification has been received that three Crewe men have been awarded the D.C.M. for gallantry at the front. They are: Sergt. H. S. Barraclough, Royal Engineers; Pte. L. G. Eaton, Royal Warwicks; Pte. A. G. Woodley, London Territorials. Pte. Eaton has also received the Croix de Guerre.

The Admiralty announce that 91 prisoners from H.M. armed boarding steamer *Tara*, who were captured on November 5th, 1915, have been recaptured. These prisoners were rescued from the Senussi by the armed motor-car raid under the command of the Duke of Westminster. Prior to the war the H.M.S. *Tara* was the London and North Western Railway Company's S.S. *Hibernia*, and the 91 men referred to include a number of North Western employés.

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Capt. W. P. Bradbury, of the Department of the Superintendent of the Line, has been promoted from the rank of Lieutenant. A year ago he sailed for France with the rank of Corporal, and returned for a short leave in April with the rank of Sergeant. He was given a commission, and came to England in July to fetch a draft of men, holding the rank of Lieutenant.

Superintendent of the Midland Railway at Leeds. He is a son of Mr. T. Haynes, of the Chief Goods Manager's Department, Derby. The following award appears in a special supplement of the *London Gazette:* "Military Cross—Temp. 2nd Lieut. Albert Ernest Haynes, R.A." Mr. S. G. Marriott, the youngest son of Mr. W. Marriott, District Locomotive and Way and Works Engineer,

LONDON AND SOUTH WESTERN RAILWAY MEN ON ACTIVE SERVICE.

The above photograph shows 13 members of the London and South Western staff accompanying a recent draft of troops for the Railway Transport Establishment Section of Overseas Forces, now in training at Longmoor Camp. The names, reading from left to right, are: Back row—Messrs. E. L. Heath (Southampton District Goods Superintendent's Office), H. G. Wallage (Central District Superintendent's Office), A. W. Comins (Western District Superintendent's Office), H. J. Moore (Raynes Park B.O.), A. C. Baker (General Manager's Office), C. Williams (Western District Superintendent's Office). Middle row—W. Fanthorp (Goods Manager's Office), H. T. Swanston (Malden B.O.), R. G. Nobbs (Main Line Relief Staff), W. Sparks (Plymouth, Friary Goods), O. S. Willmott (Chief Engineer's Office). Front row—H. L. Brazier (Secretary's Office), and H. Head (Gillingham B.O.). There were 14 members from the London and South Western Railway staff, but Mr. W. A. Sims (Western District Engineer's Office) does not appear in the photograph. We are indebted to our London and South Western Railway contemporary for this illustration and particulars given above.

Mr. C. M. P. Payne, who has been gazetted 2nd Lieut. in the Royal Scots Fusiliers, is the elder son of Major P. M. Payne, T.D., commanding 2/7th Batt. the Sherwood Foresters, the Rating Surveyor of the Midland Railway. Among officers mentioned in Sir Ian Hamilton's Gallipoli despatch occurs the name of Temp. Lieut. A. E. Haynes, Royal Field Artillery, who, before the war, was the Assistant Divisional Locomotive

Midland and Great Northern Railways Joint Committee, has been given a commission in the Royal Engineers. All Mr. Marriott's sons are now in the Army, two in the Royal Engineers and two as doctors.

Private James Beesley, of the 8th Battalion Rifle Brigade, who was a porter at the Cheshire Lines Committee's goods station, Manchester, has sent an account of how he won the D.C.M. It was in connection

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with the rescue of the late Corporal Drake, V.C., and Lieutenant Fryer. He says that they went out on patrol duty—Lieutenant Fryer, Corporal Drake, Private W. Roberts, and himself. "After going 150 yards Lieutenant Fryer and Corporal Drake advanced another 40 yards, and told me and Roberts to follow on behind. As we were getting close up to them the Germans caught sight of us, and fired. I and Roberts got in a shell hole, and when they ceased firing we came out of cover and advanced to Lieutenant Fryer and Corporal Drake. As we were getting near to them we saw that Lieutenant Fryer had been hit, and Corporal Drake was bandaging him. Then Roberts got hit, so I brought him back to the trench. I then went out with another party, but we failed to get near them, as the Germans had a patrol party out. We then took another party out, and succeeded in getting to our comrades, but Corporal Drake had been killed after bandaging Lieutenant Fryer. We got back again with Corporal Drake and Lieutenant Fryer."

The Military Cross has been gained by Sergt.-Major E. T. Moxham, R.A.M.C., 7th Cavalry Field Ambulance, British Expeditionary Force (formerly a clerk in the Divisional Superintendent's office, Great Western Railway, Cardiff). Several other honours obtained by Great Western Railway men may also be mentioned. Sergt. Tom Powley, 6th Batt. Royal Berks. Regt. (carriage shunter at Old Oak Common), has been awarded the Distinguished Conduct Medal for heroic conduct in endeavouring to rescue a wounded soldier. Unfortunately, the rescued soldier died the same evening. Sergt. A. W. Loveday, of the 1st Wilts Regt. (formerly Frame Builders' Assistant in the Wagon Frame Shop at Swindon Works), has been awarded the Distinguished Conduct Medal for heroic conduct. Lce.-Corp. Scott, of the 5th Wilts. Regt. (machineman in the Wagon Frame Shop at Swindon Works), has been awarded the Distinguished Conduct Medal. He was one of a party lost outside the British lines at Chunuk Bair (Dardanelles) for over a fortnight, at the end of which time, although greatly exhausted and weakened by privation, he, with the greatest bravery, made his way in, and so brought about the rescue of his comrades. Gunner George G. Moore, 3rd North Midland Brigade, Royal Field Artillery (shunter in the Goods department at Wolverhampton), has been awarded the distinguished Conduct Medal. Gunner W. F. Powell, 48th South Midland Division 1st Gloucester Battery (invoice typist in the Goods department at Bristol), has been mentioned in despatches for meritorious conduct.

Sapper A. E. Gage, 32nd Motor Air Line Section, Royal Engineers, has been mentioned in despatches and awarded the Distinguished Conduct Medal for "conspicuous gallantry at Vlamertingne on December 19th, when he assisted in the repair of telephone lines under heavy shell fire." Before enlisting, Sapper Gage was a telegraph lineman in the Signal Department at Acton. He entered Great Western Railway service in 1905.

Another member of the Great Western staff who has been awarded the Distinguished Conduct Medal is Fire-cleaner F. A. Hughes, of the Locomotive and Carriage Department, Llanelly, who is serving with the 1st Devonshire Regt.

Paddington Station was recently the scene of a unique war function, when Lady Smith-Dorrien, on behalf of "Women of England," handed to Major Dawson, Commandant of the New Zealand Base Depôt, Hornchurch, a silken Union Jack for the New Zealand "Heroes of Gallipoli." A silver shield, suitably inscribed, accompanied it. Immediately afterwards a contingent of about 80 New Zealand soldiers who had been in England for hospital treatment and discharged as permanently unfit for military service, left by a boat special to Plymouth, where they joined the mail steamer as passengers for their native land.

We regret to learn that news has been received in Newcastle-on-Tyne that Captain the Hon. Sydney James Drever Joicey, 10th (Service) Batt. Northumberland Fusiliers, has been killed in action in the north of France. He was the third son of Lord Joicey, Deputy-Chairman of the North Eastern Railway.

Mr. F. Wintour, Works Manager at Doncaster, Great Northern Railway, has three sons serving in the Army. The eldest, Mr. R. Wintour, joined the University Public School Battalion, and has been in France for five months; the second son, Mr. Reginald Wintour, is a Lieutenant in the Railway Transport Corps at Salonica; and the third son, Mr. Geoffrey Wintour, who was assistant engineer on the Cordoba Central Railway in Argentina, holds a commission in the Royal Engineers. One of Mr. Wintour's brothers is a Brigadier-General, another the captain of a cruiser

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in the North Sea, another a Director of Army contracts.

Mr. Edward Thompson, Carriage and Wagon Department, Doncaster, Great Northern Railway, has been lent by the Company for service in Woolwich Arsenal.

Lieut.-Col. H. T. Stephens, well known in connection with the Kent and East Sussex, Shropshire and Montgomeryshire and other smaller railways gives particulars of some of the officers serving with the Kent (Fortress) Royal Engineers who have had a railway experience. From the list it will be seen that at least 95 per cent. are from the engineering departments. To Lieut.-Col. Stephens is credit due for so large a proportion of railway men. The list is as follows: Lieut.-Col H F. Stephens, Plymouth, Devonport and South Western Junction, Kent and East Sussex Railways, etc.; Major H. W. Devey, Metropolitan; Capt. J. F. S. Higginson, South Eastern and Chatham Railway; Capt. J. W. Punter, East Indian and Egyptian State Railway; Capt. A. Wellington, San Paulo Railway, Brazil; Capt. C. H. Igglesden, South Eastern and Chatham Railway; Capt. C. Inwood, North Eastern Railway; Capt. D. H. Slack, London and North Western Railway; Lieut. R. Sawers, London and North Western and Buenos Ayres Pacific Railway; Lieut. J. Rosevcare, Buenos Ayres Great Southern Railway; Lieut. H. Criswall, Canadian Northern and Canadian Pacific Railway; Lieut. A. F. Tabraham, London and North Western Railway; Lieut. Lucas, Central Argentine Railway; 2nd Lieut. R. H. Steed, Kent and East Sussex Railway; 2nd Lieut. P. Richardson, Buenos Ayres Pacific Railway; 2nd Lieut. A. C. Dunlop, Buenos Ayres Pacific Railway; 2nd Lieut. G. Toogood, London and North Western Railway; 2nd Lieut. H. B. Gates, Metropolitan, Central Argentine, and Chilian Longitudinal Railway; and Lieut. G. W. Manlove, South Eastern and Chatham Railway; 2nd Lieut. A. C. Boyce, Great Central Railway of Canada; 2nd Lieut. J. Phillips, London and North Western Railway; 2nd Lieut. G. J. Hartley, Central Argentine Railway Company; 2nd Lieut. E. A. Walters, Great Central Railway; 2nd Lieut. B. L. Derbyshire, Great Central Railway; 2nd Lieut. E. Marson, London and North Western Railway; 2nd Lieut. G. Manning, London, Brighton and South Coast Railway; 2nd Lieut. F. Baxter, London and North Western Railway; 2nd Lieut. F. R. Kirkland, Midland Railway; 2nd Lieut. A. Washington, Great Central Railway; 2nd Lieut. J. B. N. Briers, London and North Western Railway; 2nd Lieut. J. E. Charnley, Great Central Railway; 2nd Lieut. T. Hannon, London and North Western Railway; 2nd Lieut. W. B. Hull, Cambrian Railways; 2nd Lieut. C. H. R. Bridgen, Great Central Railway; 2nd Lieut. J. Parker, Great Eastern Railway; 2nd Lieut. P. J. O'Neill, Lancashire and Yorkshire and London and South Western Railway; 2nd Lieut. I. W. Jenkin, Central London Railway.

PATIENTS AND NURSING STAFF ACCOMMODATED IN A PORTION OF THE WEBB ORPHANAGE AT CREWE.

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SERGT.-MAJOR F. GILBERT: LONDON AND SOUTH WESTERN RAILWAY.

Extract from *London Gazette*, dated February 18th, 1916. Railway Transport Officer. (Graded for purposes of pay as Staff Lieutenant, 2nd Class), and to be Temporary Lieutenant. Dated January 24th, 1916.

Mr. Amand Charles, C.E., Chief Draughtsman, Goods Manager's Department, Midland Railway, has been appointed a 2nd Lieut. in the Royal Engineers. He was a pupil of the late Mr. J. A. MacDonald, Engineer-in-Chief, and afterwards an Assistant in the new Works Section of the Engineer's Office. He was subsequently an Assistant Construction Engineer on the Beira and Mashonaland Railway for several years, with headquarters at Umtali. Lieut. Charles is the son of Mr. Alexis L. Charles, the Secretary of the Midland Railway Company.

Private Alfred Edward Davis, 1st Cambridge Territorials, is only 20 years of age, but for conspicuous bravery in the field he holds the D.C. medal. He commenced Great Eastern Railway service as an engine cleaner at March station in April, 1914. The same year he became a soldier, left England in February, 1915, and was wounded at Hooge, May 5th. Unhappily one of his legs had to be amputated. For many weeks he has been in hospitals, but is now progressing very favourably and has had an artificial leg fitted.

Another Great Eastern Railway man, Private T. A. Orbell, Suffolk Regt., formerly employed at March station, has also been awarded the D.C.M. The official record says: "During patrol work on the night of July 18th, 1915, after one of the patrol had been wounded, 2nd Lieut. H. P. Bamkin and Private Orbell at once went back to assist him. No sooner had Lieut. Bamkin reached the wounded man than he was himself hit. Private Orbell then lifted the officer on to his shoulders and carried him to our trench, under heavy rifle and machine-gun fire."

W. K. Chapman, from the running department of the Great Eastern Railway, was promoted at the beginning of the year from Company Sergt.-Major to 2nd Lieut., 2nd Essex Regt., having been mentioned in despatches and promoted for services in the field.

The President of the Board of Trade has constituted a new temporary department, termed the Department of Import Restrictions, for the purpose of giving effect to the policy of the Government with regard to the prohibition or restriction of imports of certain goods to meet the present and apprehended deficiency of tonnage. Sir W. Guy Granet, General Manager, Midland Railway, has been appointed to act in an honorary capacity as Controller of the new department.

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The Powelltown Tramway.

A Little Known "Light" Railway in Australia.

By J. H. CHERRY.

THIS light railway is laid to a gauge of 3 ft., in the bush of Victoria, Australia. It is the property of the Victorian Hardwood and Sawmilling Co., Ltd., and is used for the conveyance of sawn-timber from the several mills it serves to the Victorian State line at Yarra Junction.

The line extends from Yarra Junction to Splitters Camp, a distance of 14½ miles. It is divided into two sections, one from Yarra Junction to Powelltown; the other from Powelltown to Splitters Camp. The section from Yarra Junction-Powelltown has a number of sidings and stopping places. The latter, termed "stations," usually consist of a shelter-shed, a name board, and a siding, but no platform. Their mileages from Yarra Junction and names are as follow :—

Miles.	
—	Yarra Junction.
2½	Barrier.
3¾	No. 1 Siding.
4½	Slaty Creek.
5¾	Black Sands.
7½	Three Bridges.
9¼	Gilderoy.
10½	Powelltown.

The other section, from Powelltown to Splitters Camp, is used solely for the carriage of logs. It abounds in sharp curves, stiff banks, and in 4 miles ascends nearly 1,000 ft. The line is single throughout. It is laid with 40 lb. rails ballasted with river gravel. No fixed signals or staffs are in use, although generally more than one engine is in steam at one time.

Starting from Yarra Junction, the line climbs up the valley of the Little Yarra river to Powelltown, where the company owns a large saw-mill. Indeed, there are saw-mills near every station, while the numerous clearings are cultivated by settlers. The line passes through virgin forest nearly all the way, and naturally the scenery is magnificent. One has no conception of the wild grandeur of the Australian bush till one has seen it. The track is fenced off only here and there, and no provision, in the shape of gates or cattle grids, is made to prevent animals straying on to the line where it crosses the tracks that do duty for roads. The ruling grade is 1 in 30 and occurs frequently, and the sharpest curve is 2½ chains.

The rolling stock, which consists of three locomotives, two passenger train vehicles, and 85 for goods service, is all fitted with centre combined buffers and couplings. No brakes of a continuous nature are in use, but powerful hand-brakes are fitted to all vehicles, and steam brakes to the locomotives.

Engine No. 1 is a 2–4–0 tender engine, built by the Baldwin Locomotive Works, of Philadelphia, and bears their number 67718. This engine has all the features common to American practice; the pull-out type of regulator, sand-dome on top of the boiler and the bell rung by hand. A "Michigan" lubricator is fitted, also a gauge glass and two test-cocks. Heating surface is 357 sq. ft., of which 86 tubes (1¾ in. diam.) provide 319 sq. ft. Grate area is 8½ sq. ft. and the steam pressure 160 lb. Driving wheels are 3 ft. 1 in. diam. and the leading wheels 2 ft. 4 in. Total wheelbase is 14 ft. 4 in., of which 7 ft. is rigid. Cylinders are 10 in. diam. and 16 in. stroke and drive on the rear pair of coupled wheels. The tank carries 800 gallons of water and there is 120 cubic ft. space for fuel. The total weight is 28 tons and the tractive effort 5,880 lb. This engine is named *Little Yarra*, after the river.

Engine No. 2 is a 0–6–0 tender engine. It was built by Messrs. Bagnall (Makers No. 1965) and has dimensions as follow :—

Cylinders	10 in. diam. 18 in. stroke.
Boiler pressure	160 lb.
Heating surface—Tubes	384 sq. ft.
,, ,, Firebox	48 ,,
Total heating surface	432 ,,
Grate area	9 ,,
Wheels, diam.	2 ft. 6 in.
Wheelbase	9 ft.
Capacity of tank	800 galls.
Space for fuel	150 cubic ft.
Weight, roadworthy	27 tons.
Tractive power	7,000 lb.

This engine is fitted with a "Detroit" sight feed lubricator, one water glass and two test-cocks. The link motion is Stephenson's pattern. It is named *Powellite*.

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Engine No. 3 is a diminutive 0–4–2 saddle tank locomotive, built by Messrs. Kerr, Stuart & Co., Ltd. (Makers No. 539). Cylinders are 5 in. diam. and 12 in. stroke. The coupled wheels are 2 ft. in diam. The steam pressure is 130 lb. The total weight is only 4 tons. The *Little Yarra* is painted red with white bands, the *Powellite* green with white bands, and the No. 3 green unlined.

The goods wagons are of two kinds—one without sides and the other with them. Those without sides are the smaller. Respective dimensions are as follows:—

Wheels, diam. ..	2 ft.	2 ft.
Wheelbase ..	9 ft.	6 ft. 6 in.
Length over all ..	16 ft.	12 ft. 6 in.
Width	6 ft. 6 in.	6 ft.
Capacity	5 tons	3 tons.
Tare	2 tons	1 ton 5 cwt.

POWELLTOWN TRAIN AT YARRA JUNCTION.
0–6–0 engine, No. 2, *Powellite.*

Carriages are carried on two four-wheeled bogies and their tare is 4 tons. They seat 20 passengers and are 24 ft. over all. Width is 6 ft., wheelbase of each bogie 4 ft. and the bogie centres are 16 ft. apart. The diameter of the wheels is 2 ft. Part of each carriage is used as a luggage van, so they are really composites.

The line pays very well, as besides sawn-timber, considerable quantities of agricultural produce are carried. Initial cost was low, as there are no extensive earth-works; there was nothing to pay for land, sleepers or ballast, and second-hand rails were used. Repairs are few, as the rolling stock is all very light.

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CAPT. H. P. M. BEAMES: WORKS MANAGER AT CREWE, LONDON & NORTH WESTERN RAILWAY.

CAPT. HEWITT PEARSON MONTAGUE BEAMES, hitherto a Chief Assistant to Mr. C. J. B. Cooke, Chief Mechanical Engineer, London and North Western Railway, and who has been appointed Works Manager at Crewe, in succession to Mr. W. H. Warneford, who becomes Wagon Superintendent, is the youngest son of the late Major Pearson T. Beames, of the 69th and 11th Regiments. He was educated for the Army at Corrig School, Kingstown, Co. Dublin, Dover College, and at Crawley's Military Academy, Dublin. He entered Crewe Works as a premium apprentice in January, 1895, and after serving his time was pupil to the late F. W. Webb. He had charge of Carlisle running sheds, shops, and district, for a portion of the year 1899, and became Junior Assistant to the Manager of Crewe Works, September, 1899. On the outbreak of the South African War, with the permission of the London and North Western Railway, Mr. Beames volunteered and served as trooper and sergeant in Paget's Horse, being present at the operations in the Western Transvaal during 1900–1901. He returned to Crewe in June, 1901, and resumed his position as Junior Assistant to the Works Manager, until appointed Assistant Superintendent, Outdoor Department, in January, 1902. In January, 1910, Mr. Beames was appointed personal assistant to the Chief Mechanical Engineer, which position he held until the outbreak of the European War, August, 1914, when, with the permission of the Directors of the London and North Western Railway, he offered his services to the War Office, and was given command of the 110th Railway Company, Royal Engineers, which position he held until released from service abroad to take up his present post, which dates from April 1st, 1916.

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PERTINENT PARAGRAPHS

Staff Changes on the London and North Western Railway.

We are officially informed of the following important Staff changes on the London and North Western Railway, which came into force on April 1st :—

Mr. A. R. Trevithick appointed Carriage Superintendent at Wolverton, in succession to Mr. Earl, who is retiring from the service.

Mr. E. P. W. W. H. Warneford succeeds Mr. A. R. Trevithick at Earlestown as Wagon Superintendent.

Mr. H. P. M. Beames, in addition to his duties as Chief Assistant to the Chief Mechanical Engineer, is also Works Manager at Crewe.

On another page a portrait of Mr. Warneford is included in our Railway Portrait Gallery series. It will be remembered that in Mr. Gairns' article on Crewe Works, published in April, 1913, a portrait was included and reference made to Mr. Warneford, as Works Manager, while in October, 1914, a full description of Wolverton Carriage Works included reference to Mr. H. D. Earl, as Carriage Superintendent.

Common User of Railway Wagons.

In view of the frequent public claims to alleged advantages attending the pooling of railway wagons, the announcement that an arrangement has been made for the common user of Great Western, Lancashire and Yorkshire, London and North Western, Midland and North Eastern Railway Companies' open deep-sided wagons, is noteworthy.

This course has been adopted with a view to relieving difficulties which have arisen in regard to railway transport consequent upon the war by reason chiefly of the enormous amount of Government traffic which the companies are called upon to deal with, and to the fact that the traffic to and from certain ports has become extremely heavy.

The circular notifying this arrangement is as follows :—

Commencing at 4 p.m. on Sunday, April 2nd, 1916, and until further notice, all open deep-sided wagons of three or more planks, with doors on each side, belonging to the Great Western, London and North Western, Midland, and North Eastern Companies, and those of the Lancashire and Yorkshire Company specially marked with four white crosses on each side, will be available for use as common stock for the purpose of the five companies, with the following exceptions :—

All coke wagons.

All wagons which have not side doors the full depth of the wagon.

All wagons exceeding 21 ft. in length over buffers and 10 ft. 6 in. in wheelbase.

Great Western vacuum-fitted stock.

Great Western high-sided wagons used for military horses.

Midland hopper bottom, end door, and 12-ton high-sided wagons.

North Eastern open fish, salt, and sleeper wagons.

All other vehicles, including the exceptions, must continue to be dealt with in accordance with existing regulations.

On dock estates, harbours, collieries, and works served by either one or more of the five Companies parties to the common user arrangement, the user of the five Companies' wagons in common is permissible to or *viâ* the lines of any of the five Companies concerned, but not otherwise.

All companies outside these arrangements must return the wagons of the five companies named directly and promptly to the owning companies.

J. A. F. Aspinall.
A. Kaye Butterworth.
Guy Calthrop.
Guy Granet.
F. Potter.

Preliminary work involved.

The scheme is the outcome of many months' work on complicated details. As a result, at docks, harbours, collieries, and works served by the lines of any of the five railways, the common user of open deep-sided wagons will be available for loading to any place served by, or over the lines of any of the five Companies to railways beyond, but not otherwise. On each system it will now be justifiable for, *e.g.*, a London and North Western station agent to load a wagon received from the Great Western, Midland, Lancashire and Yorkshire, or North Eastern Railways to any station, instead of, as formerly, to a station on, in the direction of, or beyond the owner's line.

The new arrangement, which covers some 200,000 wagons, is an extension of the back-loading principle, with the modification that there will be a weekly balance as between the respective companies, and those which receive a greater number of wagons than they have forwarded will be required to at once adjust the exchange.

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In connection with the foregoing, it will be remembered that under date December 9th, 1915, the General Managers of the Great Northern, Great Central, and Great Eastern Companies—which have a working agreement in other directions—issued the following circular :—

"Commencing Monday, December 13th, 1915, and until further notice, Great Northern, Great Central, and Great Eastern ordinary open goods wagons having sides of three or more planks, and also the wagon sheets of those Companies, must be dealt with and used as common stock for the purposes of the three Companies. All other vehicles must continue to be dealt with under existing instructions. Wagons of the three Companies, of the description named, and also wagon sheets, must be included in the daily stock reports and in any other statements now rendered relating to wagons and sheets."

The Disaster to the *Sussex*.

On Friday, March 24th, the twin-screw steamer *Sussex*, sailing under the French flag on the Folkestone-Dieppe service, was either torpedoed by a German submarine or damaged by a mine explosion. The forefront of the vessel was badly damaged, and a number of the casualties were due to the explosion; but the vessel was towed to the French coast without foundering. The *Sussex* was one of the larger twin-screw vessels used on the joint London, Brighton and South Coast and State (Western) of France service. She is a very similar vessel to the *Arundel*, both having been great favourites on the Newhaven-Dieppe route, though they have had to give pride of place to the later turbine vessels. She is 275 ft. long, 34 ft. broad, and depth is 14 ft. Gross tonnage is 1,353, and indicated horse-power 5,000, provided for a speed of 20·65 knots. The vessel was engaged on ordinary public non-combatant service, while passengers and crew include considerable numbers of persons of neutral nationality.

The following letter appeared in *The Times* from Sir William Forbes, General Manager, London, Brighton and South Coast Railway :—

"Sir,—As some confusion has apparently arisen with regard to the present ownership of the s.s. *Sussex*, built in 1896 by Messrs. Denny Brothers, of Dumbarton, for the London, Brighton and South Coast Railway, I beg to say that this ship was transferred by my Company to the French State Railways in January, 1914, and since the outbreak of war has been running between Dieppe and Folkestone, flying the French flag, under French regulations, and in command of a French captain and manned by a French crew. The credit of bringing this ship into port in her crippled condition, after she was torpedoed on Friday last, is due therefore to Capt. Mouffet, the officer of the French State Railways, who was in command."

In the House of Commons, Mr. Runciman, replying to a question, said the *Sussex*, being a French vessel, belonging to the French State Railways and sailing under French regulations, any inquiry into the circumstances of the accident would be naturally made by the French authorities.

Three-position Signals on the Great Central Railway.

We understand from our Great Central Railway contemporary that three-position signals are being installed in connection with the new Scherzer rolling lift bridge which is being erected over the Trent at Keadby. Eight signals will be provided, four on each line, and covering a length of about 2¼ miles. As the Great Western Railway signal of this type outside Paddington station stands alone, this Great Central Railway installation will be the first to provide opportunities for trial along a length of line and subject to standard running conditions. The normal aspect is the standard horizontal position, with a red light. The intermediate position is pointing upwards at an angle of 45 deg., and at night displaying an orange-coloured light, equivalent to a distant signal at "danger." The next movement from the 45 deg. position to a full vertical position is accomplished automatically. When the next stop signal ahead rises to the 45 deg. position, the one in the rear rises to 90 deg., or where the former is not full braking distance from the next signal ahead, then two signals have both to be at 45 deg. before the rear signal rises to 90 deg., with a green light at night. These signals will, of course, be operated electrically, and on semi-automatic principles.

Broad Gauge Railway Track.

Following up correspondence recently published concerning the broad gauge days of the Great Western Railway, Mr. W. S. Robson, of Cardiff, writes further, dealing this time with the alleged "superiority" of broad over narrow gauge track construction. He claims that this was "demonstrated in a practical manner by the 7 ft. 8½ in. convertible single-wheelers, which were put to run on the broad gauge, during the last two years of its existence. This type of engine, on the broad gauge, did very well, but afterwards, on the narrow gauge, gave no end of trouble, riding very badly and 'sticking' for steam all over the road. One of them broke the leading axle and another one left the road in Box Tunnel in 1893." Mr. Robson states that "these engines, when running, had a 'see-saw' motion, together with other jerky movements," and suggests that this "very probably shook the fire solid in the firebox, thus checking the passage of air through the burning coal and consequently preventing efficient combustion, a shortness of steam being the result. The tubes of the boilers leaked badly, and, in order to prevent this, a kind of 'lip' ferrule was fitted in the tubes, at the firebox end, the 'lip' protecting the tubes at their connections to the tube-plate. There were two engines, at Bristol, fitted with these ferrules, and it was found, after running about 30 to 40 miles, that the ferrules became choked

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with soot and cinders, the indicator of the pressure gauge then simply running back. This type of ferrule had been adopted, by the British Admiralty, in the boilers of locomotive type fitted in their torpedo boats some years previously. These single-wheelers shortly afterwards were fitted with leading bogies, and their cylinders reduced in diameter from 20in. to 19in."

On the other hand, Mr. Robson refers to the choice of engines put on to run the Northern expresses through the Severn Tunnel in 1888. The 486 and 588 class of 2–4–0 engines were first used on these trains from the Bristol end. They had 6 ft. coupled-wheels and cylinders 17 in. by 24 in. They also ran the 6.20 p.m. express from Paddington to Bristol, and the timing and weight of this train were about the same as those of the Northern expresses. "It was, however, found that the boilers steamed more freely when running on the 'chair' road between Bristol and Shrewsbury, than when running from Paddington to Bristol on the old 'baulk' road. This was probably owing to the easier riding of the engines on the 'chair' road, which did not affect the fire the same as the rough riding on the 'baulk' road."

Great Western Railway Engine "Rocket."

"In reference to the question of the Great Western Railway engine *Rocket*, there was an engine of this name, and answering the description given," continues Mr. Robson. "It was constructed by Messrs. Hawthorne, of Newcastle-on-Tyne. There were several engines of the same type constructed about 1840, and amongst them were the *Fireball*, *Meridian*, and *Fire-King*. They were of the 2–2–2 type, with cylinders 15 in. by 18 in., and driving wheels 6 ft. in diameter. They were broad gauge saddle tank engines and had high-top fireboxes. The *Fireball* and *Meridian* ran the opening train from Bristol to Bath in 1840. They were erected in Saltford Tunnel, near Bath, the parts having been brought there on trolleys. The *Meridian*, with Mr. Brunel on the footplate, was the first engine to go through Box Tunnel, and on the return journey ran before the first train from Chippenham to Bath. The *Fireball* ran the opening train from Bristol to Bridgwater in 1844. A relative of mine was the driver of the *Meridian* in 1840, when only 18 years of age, and took part in the above. My grandfather drove the *Fire-King* in the early 'forties, and had the famous steam-carriage *Fairfield* on the Tiverton branch in 1848. He also took this vehicle to Weston-super-Mare about 1850, where it was worked for some time on the branch between Weston-super-Mare and the Junction. My grandfather, who, as a boy, worked at Walbottle Colliery when George Stephenson was engine-wright there, also drove the first Bristol and Exeter 9 ft. single-wheel tank engine in 1853, and my father drove the *Tornado*, the last actual broad-gauge engine constructed, from 1890 up to the end of the famous gauge in May, 1892."

A Canadian Rugby Junction.

We are indebted to Mr. R. E. Carter for the photograph of Rugby Junction Signal Cabin, in the Canadian Pacific Rail Yard at Winnipeg. Before the opening of the Bergen-Transcona cut-off for through freight traffic, all the main line traffic both freight and passenger going through the Winnipeg yards of the C.P.R. was handled and controlled from this cabin. In addition, all traffic on the Souris, La Riviere, Arborg and Winnipeg Beach lines is also controlled by this station, to say nothing of the immense amount of work involved in the handling of traffic in the yards to the Winnipeg Stock Yard, to the "rip" yard and to the Weston shops. To-day the situation has been greatly relieved, as the cut-off takes the through freight traffic by another route.

This particular plant consists of a 72 lever frame, with some 65 working levers. In moderately busy times, the operators handle probably about 100 levers per hour, while under pressure they often have to attend to double that number. There are eight interlocking towers in the immense Winnipeg yards of the C.P.R. A number of electrically operated towers have been installed on the Canadian systems, but the Rugby Junction is a good example of the old style.

Glasgow and South Western Railway Locomotives.

That the notes concerning the engines of this line have aroused considerable attention is shown by a letter received from a Dalry reader. He writes :—"Mr. Malcolm Niven's remarks on the early locomotives of this line cannot fail to be interesting. I might amplify these remarks, and perhaps slightly amend them. The old 2–4–0 Stirling passenger engines (old 8 class) were all rebuilt in Mr. Smellie's time, and fitted with cast-iron chimneys and Ramsbottom safety valves placed on the middle ring of the boilers, instead of the original copper-topped chimneys and safety valves (over the firebox) with copper covers. In their original state they were very handsome, albeit small engines, and were always accounted excellent steamers, even when loads began to be in excess of their powers.

"I wonder if Mr. Niven or any other interested reader could furnish particulars or perhaps a sketch of the 2–2–2 outside cylinder singles built by Patrick Stirling, and which were the prototypes of his famous Great Northern singles? Except for the bogie, these engines were almost exact smaller editions of the No. 1 class Great Northern, chimneys, safety valves, cabs and splashers, with many other minor details being very similar. They were scrapped in the 'eighties, proving too light for increasing loads.

"I think Mr. Niven is in error in saying that 25 of the James Stirling 7 ft. 1 in. bogies (4–4–0) were rebuilt by Mr. Manson. To my knowledge only 16 were so treated. What their original numbers were I do not know. After running as A's with their original numbers, and being replaced by engines of the new No. 8 class in 1895–6, 16 were rebuilt and numbered 191–206.

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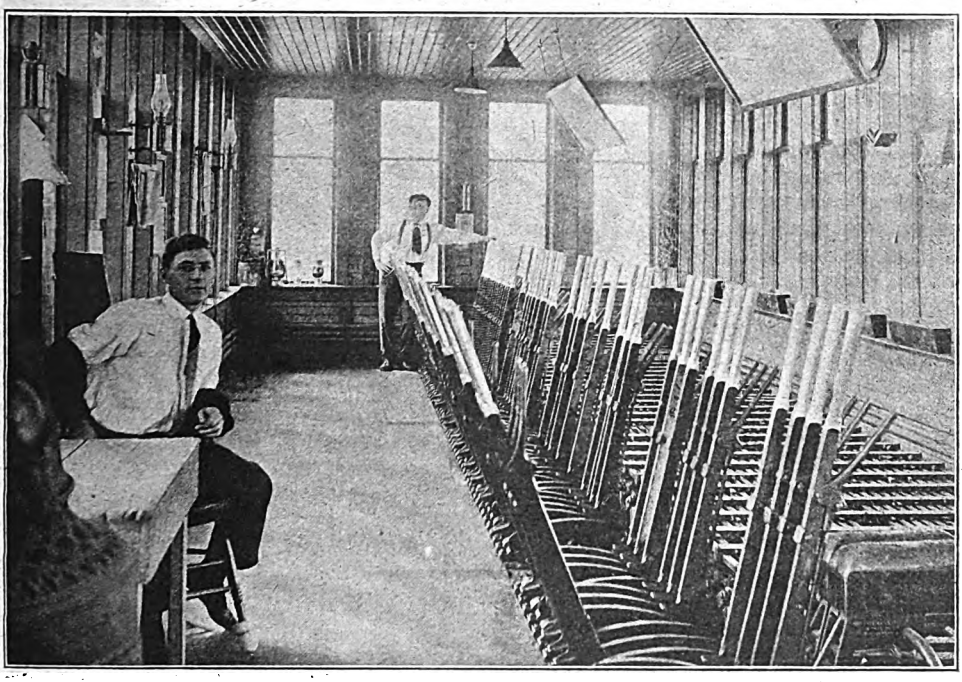
These numbers were taken from 0–4–2 suburban tanks (which had originally been tender engines of the earlier 0–4–2 mixed traffic class). These 16 old bogies are still running, mostly on slow traffic, but able still to make a good sprint when necessary with a light fast train."

"As to Mr. Smellie's 2–4–0 engines (26 class) there were 12 of these. Their numbers were :— 18, 26, 27, 28, 29, 31, 40, 42, 157, 158, 185, 186, now all running under A's. They appeared in 1879–1880 and were used for four or five years for the London trains to Carlisle, until replaced by the 52 class, virtually the same engine but with a bogie replacing the pair of leading wheels. These in turn took the Carlisle express traffic, until the advent of Mr. Manson's No. 8 class in 1892. One of them, No. 70, bore the Royal Arms on the cab for many years, having hauled the Royal train from Carlisle to Arkleston Junction, Paisley, in 1888, when Queen Victoria made a visit to Scotland and stayed at Blythswood (near Renfrew). Mr. Manson's new No. 26 class began to appear in 1907–8. There were 12 of these, bearing same numbers as Mr. Smellie's 12 2–4–0 engines. Another was added in 1912, No. 130, making this useful class up to 13 engines."



Photo] [*R. C. Carter.*

INTERIOR OF RUGBY JUNCTION SIGNAL CABIN, WINNIPEG, MANITOBA.
71 lever manual frame, 67 working levers.

Tank Engines on the Glasgow and South Western Railway.

LAST month one of Mr. P. Drummond's new 0–6–2 tank engines for this line was illustrated; and this suggests that some reference to the older tank engines will be of interest. Mr. Malcolm Niven writes pointing out that in 1893 Mr. Manson designed for suburban train traffic ten 0–4–4 side tank passenger engines. They were built by Neilson & Co., of Hydepark Works, Glasgow, and they were numbered 326 to 335. They ran trains to Springburn over the City Union Railway, and also to Bridgeton Cross. When these services were withdrawn owing to tramway competition, these engines ran to Barrhead, Potterhill, and Johnstone (North). Now these engines are serving in various capacities, running between Glasgow and Dalry and similar routes which are in keeping with their water capacity. The engines above referred to replaced old 0–4–2 side tanks which themselves followed Mr. Smellie's 2–4–0 No. 26 class. In the late 'eighties and early 'nineties, R26 (one of the 0–4–2 class) ran the Engineer's private car No. 0.

"The Great North of Scotland Railway tank engine, illustrated on page 204, March number," writes Mr. Niven, "is, I am sure, a Manson design, as it is similar in nearly every particular to his 326 class referred to." Mr. Niven also points out the great similarities between the rebuilt South Eastern and Chatham 4–4–0 tender engines, also largely rebuilds of Mr. Stirling's designs, to the Manson rebuilds of Stirling engines now running between Glasgow and Kilmarnock, Ayr, etc.

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When Mr. Smellie came to take charge of the Locomotive Department at Kilmarnock, Mr. Stirling going to the South Eastern Railway, Mr. Stirling had designed four 0–4–4 side tank locomotives, Nos. 1, 2, 21 and 38. "They had steam reversing gear fitted below the framing similarly to the reversing engines on others of his locomotives, an expansion index being fitted to show the driver the cut-off and position of link when running. Another peculiarity of these engines was their beat in back gear, by which they could always be recognised. They came out before the Smellie 2–4–0 engines previously referred to. Mr. Smellie built a number of goods engines during his term. He died after the great strike of 1890 or 1891."

A Royal Engine on the Glasgow and South Western Railway.

In view of a Dalry reader's letter already quoted, a further communication from Mr. Niven is of interest, in that he also refers to No. 70, which at one time bore the Royal Arms. "This was one of Mr. Smellie's 4–4–0 engines and conveyed Queen Victoria from Glasgow to Blythswood, Renfrew, when she stayed there as the guest of Lord Blythswood in 1888. At the same time the late Queen visited Paisley and the Glasgow International Exhibition. No. 70 is now at Ardrossan, but the coat of arms has been removed. Mr. Adair drove her on that occasion, and subsequently on the Glasgow and Carlisle expresses. He is since long dead. No. 70 was probably turned out from Kilmarnock Works about 1888. It had originally an extended smoke box."

The Great Storm.

Monday and Tuesday, March 27th and 28th, witnessed one of the most severe storms the home railways have had to contend with; and in some respects the traffic difficulties experienced were as severe as any hitherto experienced. Apparently the midland and northern counties were most severely affected, but the effect of traffic dislocation extended into all parts of the kingdom, owing to the very late and uncertain running of most of the long-distance express trains on such services as London-Scotland, London-Liverpool and Manchester, etc. In many places telegraph wires and trees were blown down along the line, while numbers of signal posts were down and the block instruments rendered useless, so that hand signalling had to be introduced over long stretches of line. Added to the climatic difficulties caused by the blizzard, were the snow-blocks which interfered with certain routes, and necessitated the partial cessation of traffic on the more exposed branches, such as the High Peak line, and the Darlington-Tebay section of the North Eastern Railway. Of the great trunk lines to the North, the Midland and the London and North Western Railway appear to have suffered most. The former was seriously affected in Derbyshire and near Leicester, as well as on the Appleby-Carlisle section; while the latter involved difficulties on the Trent Valley section, in the Birmingham area, and at Cheddington, as well as in the northern districts and on the Preston-Carlisle division. Many expresses arrived six or more hours late, while in other instances trains were cancelled, or combined. A further difficulty was a dearth of locomotives, owing to the non-arrival of so many trains whose engines, scheduled to work return trains, were not available therefor. The Midland line near Leicester was blocked for some considerable time during the day, and the service from Manchester to London was suspended. A number of outgoing trains were cancelled, and various services discontinued or combined. Mail trains for Swansea and Cardiff were in some cases as much as six hours late. A train was snowed up at Colbren, on the Neath and Brecon Railway, and all traffic was stopped between Neath and Merthyr, the line being blocked by fallen trees. Near Port Talbot, a large signal-box was blown down, and signal-posts and telegraph-poles in the neighbourhood were thrown to the ground. In the Slough district two trees fell on a Great Western Railway motor 'bus, missing the driver by inches. On Wednesday many of Tuesday's trains had not arrived, and the breakdown of telegraphic communication rendered it impossible to ascertain where many trains were. For several days afterwards long-distance trains were seriously delayed owing to sections of line having to be controlled by hand signalling until signals could be re-erected and the telegraphic system restored.

Closing of Stations on the Great Eastern Railway.

No fewer than nineteen Great Eastern Railway stations are to be closed as from May 1st. In the suburban district the effect will be to make all trains fast from Liverpool Street to Hackney Downs and Stratford, Bishopgate (for passenger traffic), Bethnal Green, Globe Road, Coborn Road, Cambridge Heath, and London Fields being closed. On the Fenchurch Street line Shadwell and Leman Street are being closed, but Stepney, Burdett Road, and Bow Road will remain in use. Further out are Chigwell Lane (beyond Loughton), Epping, Barkingside (on the Fairlop loop), Bradfield (on the Harwich branch), Buckenham (Norwich-Reedham section), Earsham (near Bungay), Geldeston (near Beccles), Stanhoe (near Burnham Market), and Mardock and West Hill, on the Buntingford branch. Maldon West and Trowse will be closed for passenger traffic. The drastic closing of inner London stations will, no doubt, drive much of the traffic to and from the City to the trams; but as they already take the bulk of it, and what has remained to the railway has largely been retained by very cheap fares, there will be little grievance on this score. A rather

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more important factor is the traffic from suburban districts to these stations, including school teachers, scholars, and people employed in the semi-industrial localities adjacent to some of these stations. Such passengers are not, perhaps, very numerous, but there are enough of them to justify their being studied, and no doubt their sacrifice is only being enforced after due consideration. The continued use of Bow Road is a partial compensation, as suburban passengers from the Loughton and Ilford routes can travel there for the Coborn Road district, and the station is on a direct tram route which parallels the line up to Liverpool Street, and is never very far away. Similarly, from Hackney Downs tram facilities will be available. Stepney is of importance in that it provides for interchange with the dock-serving Blackwall route, while Burdett Road is convenient in many ways. This section is also concerned with the Fenchurch Street-Woolwich and Albert Dock trains, as well as those of the Midland (London, Tilbury and Southend section) Company. The other stations concerned are mainly of an intermediate rural character. Entirely new suburban time-tables have been prepared, and the closure of these stations enables many changes to be made. Many trains start a few minutes later so as to take up their old times at Hackney Downs or Stratford, while up trains usually keep the original times as far as these stations and are thence fast to the terminus. In several instances these alterations realise a more equable distribution of trains, an important consideration at busy periods, while there is a general gain in journey times of from 3 to 6 minutes to or from Liverpool Street.

The Budget Tax on Railway Passenger Tickets.

A LIVE issue was raised by the proposed tax upon railway passenger tickets, and there was a great deal of adverse comment upon the suggestion, culminating in its complete withdrawal. The tax was not to apply to journeys which cost 9d. or less, but on all journeys from 9½d. to 1s. a tax of 1d. was proposed, and an additional penny for every 1s. or part of 1s. The White Paper issued in connection gave the following details :—

All journeys wholly or partly by rail beginning in the United Kingdom and ending in the British Islands :—

Single fares from 9d. to 1s.	1d.
Single fares over 1s., and all fares (single or return) over 1s. 6d.	1d. for every shilling or part of a shilling.

All journeys wholly or partly by rail beginning within the United Kingdom, but ending outside the British Isles :—

First-class fares	4s.
Second-class fares	3s.
Third-class fares	2s.

It was further explained that return fares would be treated as single fares, but no duty would be charged on a return fare which does not exceed one shilling and sixpence, or on a season ticket representing such a return fare. Also that the expression "railway passenger fare" includes a light railway fare, and any money paid for season tickets, and any payment for extra accommodation for sleeping or other purposes, or for special travelling facilities, and also any through fare, notwithstanding that part of the payment for the through fare is for travelling otherwise than by railway.

There were many objections to the proposed tax, one of the strongest being that there is now very little travelling for pleasure, while it would have entailed penalising business journeys, besides pressing unduly upon season ticket holders living a dozen or more miles out. Difficulties as to collection, involving additional labour upon depleted railway staffs, also influenced the matter, and the announcement that this proposed tax would be withdrawn was received with general relief.

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WHAT THE RAILWAYS ARE DOING

A NEW rest-room for soldiers and sailors was opened recently at Queen Street station, Glasgow (North British Railway), by Lady Beatty, wife of Admiral Sir David Beatty, of *Blucher* fame. The rest-room in question is under the care of the Scottish branch of the Red Cross Society. The accommodation which the Society formerly received from the North British Railway while it was the best that could be provided then, was not sufficient to meet requirements. Accordingly another room, hitherto part of the parcels forwarding department, has been placed at the disposal of the Society, for which accommodation Mr. Whitelaw, Chairman of the North British Railway, was duly thanked. The Young Men's Guild of the Church of Scotland have in contemplation the provision of a hut at Buchanan Street (Caledonian Railway) and St. Enoch (Glasgow and South Western Railway) stations, for the same purpose as the one now opened at Queen Street Station. There appears to be no accommodation at these stations which could be conveniently converted into rest-rooms, and it is, therefore, proposed to erect huts inside the station for the purpose.

* * *

A GENERAL meeting of the Cambrian Resorts Association was held at Barmouth on March 2nd. There were present Mr. S. Williamson, (General Manager, Cambrian Railways), Mr. W. H. Williams (Traffic Superintendent), Mr. Hodson, Mr. Kenrick Minshall (Solicitor), Mr. J. J. O'Sullivan (Corris Railway), Mr. E. C. Crick (Festiniog Railway), and representatives of local authorities. Mr. S. Williamson was unanimously voted to the chair, and Mr. W. H. Williams undertook the secretarial duties. After discussion it was moved "that it was advisable to carry on the Association, and that the secretary should be asked to communicate with each district inviting it to send delegates to another general meeting to discuss what further procedure should be taken." It was also suggested that landowners, quarry owners, etc., should also be invited to attend and take part. Mr. Newell expressed gratitude to the Cambrian Railways for the generous treatment accorded the Association, and for the frequent concessions and improvements effected by them on the railway. This winter a system of steam-heated coaches has been established on the coast, and the Cambrian Railways Directors and officials are always accessible to the public and give careful consideration to suggestions put before them for local improvement.

THE Board of Trade have recently confirmed the undermentioned orders made by the Light Railway Commissioners:—(1) Dearne District Light Railways Order 1915, authorising the construction of Light Railways in the County Borough of Barnsley in the Urban Districts of Ardsley of Worsborough of Wombwell of Wath-upon-Dearne of Swinton of Bolton-upon-Dearne and of Thurnscoe in the Parish of Brampton Bierlow in the Rural District of Rotherham and in the Parish of Adwick-upon-Dearne in the Rural District of Doncaster all in the West Riding of the County of York. (2) Derwent Valley Light Railway (additional Capital) Order 1915, authorising an increase of the Capital and Borrowing Powers of the Derwent Valley Light Railway Company.

* * *

THE latest ambulance train (No. 26), constructed at the Great Western Works at Swindon for use on the Continent, was exhibited at Paddington station from March 16th to 18th inclusive, at Birmingham on March 20th and 21st, at Shrewsbury on March 22nd, at Oxford on March 23rd and 24th, and at Reading on March 25th. This train is modelled on the same lines as the one exhibited in August last. It consists of sixteen coaches, its extreme length being 960 ft. and its weight 442 tons. During its exhibition at Paddington 2,833 members of the public and 1,714 of the staff passed through the train. The whole of the proceeds will be devoted to railway charities.

* * *

THE trustees of the Railwaymen's Convalescent Homes at Leasowe, Herne Bay and Ilkley, are desirous of obtaining suitable designs for a poster advertising the Homes, in a form generally attractive to the public, and prizes of £5 5s., £3 3s. and £2 2s. respectively are offered for the three designs considered most suitable for the purpose. The offer is made subject to the right of the trustees to reject any or all of the designs submitted, and that designs accepted become the property of the Homes, without further payment than the prize obtained. A competitor may send in more than one subject, and the competition is open to the public. Designs, which must be of reasonable size for poster work, should reach the head office (116, Victoria Street, London, S.W.) carriage paid on or before June 6th with the name, address, occupation (and where employed) of the sender clearly written on the back.

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Mr. Alfred Brook has been appointed Assistant Divisional Superintendent, Great Western Railway, at Birmingham. He entered the service in 1878, and after passing through various positions in the Passenger Department in the Plymouth division, was transferred to Paddington in 1903, and in 1907 was appointed chief clerk to the Divisional Superintendent at Birmingham. Mr. B. Billingsley has been appointed by the Directors to succeed Mr. Lucas as Assistant District Goods Manager for the Birmingham and South Staffs District. He entered the service of the Company at Bilston in 1873. In 1891 he was promoted to a higher position at Hockley, where for some years he had considerable experience in various branches of railway working. In September, 1905, he was appointed Chief Clerk to Mr. Bowdler (then District Goods Manager at Birmingham).

* * *

Visitors to Euston station are greatly impressed by the maze of scaffolding now occupying the Great Hall. Very little is yet to be seen of the finished result, with the exception of one panel at the northern end which, picked out in relief, gives a very fair idea of the scheme of decoration. Some thirty-three years have elapsed since the last painting and decorating was done to the Hall, although preparations were made subsequently to repeat the process. The Hall dates back some seventy years, having been erected in 1844 from the designs of Hardwick. It is in form a double cube, with a height and breadth of about 60 ft., and a length of twice that measurement. The ceiling, modelled after the work of some of the best Italian masters, is boldly panelled and gracefully ornamented, and is one of the largest flat ceilings in this country. In the four corners are eight panels, with allegorical sculptures, emblematic of the various chief towns and districts linked together by the then new railway. The scaffolding is of a very elaborate nature, and has been carried out under difficulties due to depleted staff, having been erected, without in any way restricting the use of the Hall, by six men of the Permanent Way Department.

* * *

Great Central Railway 2–6–4 superheater tank engine No. 340 has been fitted with a Wakefield force feed lubricator for axleboxes. The oil is delivered from an ordinary Wakefield force feed pump, such as is used for lubricating valves and pistons, and is led through a copper pipe to a point near the axlebox, where a connection to the box is made through the centre oil hole by means of flexible metallic tubing. The two side oil holes of the box are plugged up so as to retain the pressure of oil in the bearings. The flexible tubing is used to allow for the upward and downward movement of the axlebox in the frames. Engine 1134 has been fitted with a new smoke consumer, an invention of Mr. J. G. Robinson, chief mechanical engineer.

On March 6th a new station was opened at Porthcawl, Great Western Railway, on a portion of the site of the old Dock property, about a quarter of a mile south of the old station. The distance from the new station to the sea front is about 150 yards, and access to the front will eventually be obtained by means of a new road which the Urban District Council is constructing to connect the Esplanade with the sands. The new station has been specially designed with the object of affording adequate accommodation for efficiently dealing with the large number of visitors who arrive daily at this popular watering place during a normal season, amounting at times to as many as 10,000. The station buildings measure 100 ft. by 30 ft. and are constructed of timber framing covered with asbestos sheeting inside and out. There are three platforms of a minimum width of 20 ft. and a total length of 2,160 ft. face, 3,000 square ft. being under cover. In the old station there were only two platforms, the total length of face being 912 ft. The office and waiting-room accommodation is schemed on generous lines, the booking hall and waiting-room being 40 ft. by 30 ft. Wood block floors are provided throughout, and the station is lighted by gas. In the construction of the short length of new line between the old station and the new, it was necessary to cut through a bank, composed chiefly of sand, which formerly carried the roads leading to the old coal tips, and about 30,000 cubic yards of soil was removed and tipped into the inner basin of the dock, which is now disused.

* * *

At Llanilar, Great Western Railway, the station buildings have been rebuilt and additional accommodation provided. The Great Western Railway Directors have recently authorised new works as under:—Heathfield.—Provision of direct connection between Teign Valley and Moretonhampstead branches; Mortimer.—Provision of crossover road; Manchester.—Office accommodation for women clerks, No. 1, Grape Street; Cannock Road, Wolverhampton.—Substitution of gas for oil lamps.

* * *

Medbourne passenger station and goods and coal depôt, Great Northern Railway, have been closed until further notice. Passenger train service between Peterboro' (Great Northern) and Leicester (*viâ* Wansford) is also suspended. Traffic to and from Medbourne and district is now dealt with at Hallaton (Great Northern and London and North Western Joint) station.

* * *

Referring to a note in the February Railway Magazine stating that certain Great Western Railway engines had been withdrawn from service, Mr. W. L. Kenning writes that he saw No. 1100 recently in the hands of Oxford men. He also mentions that 4–6–0 engines Nos. 2916, 2922 and 2932 are now at Oxford. Nos. 3205, 3515, 2465, 2333, 2417, 2567, 615

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(various types) have all been fitted with Belpaire fireboxes recently. Mr. Kenning also refers to two new goods trains from Banbury Junction to Redhill, South Eastern and Chatham Railway, worked by 2–6–0 engines.

* * *

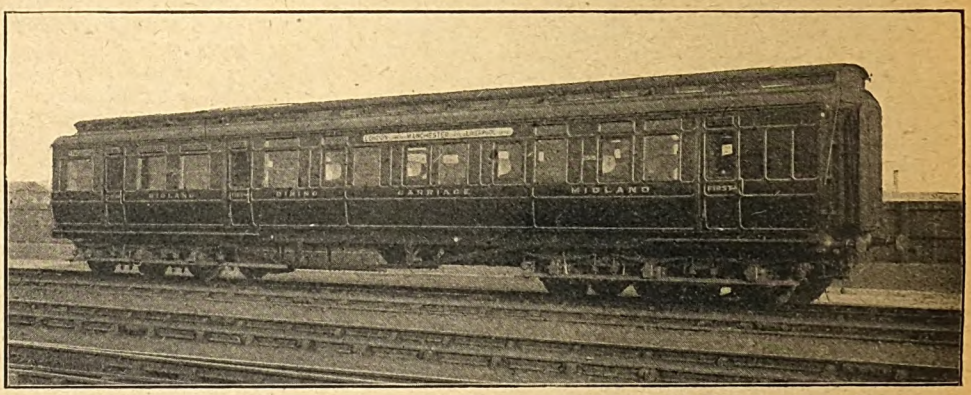
Of four designs by Fred Taylor, which are to treat of the four seasons of the year in a simple decorative manner, the first has made its appearance on the UndergrounD stations. Each will depict the same river bank, but under the changing conditions of the year. The foreground of the "Spring" design is rich with daffodils, crocuses and narcissi. Beyond this bank and seen between the trees is a stream which breaks into eddies and reflects in its water the steely blue of a spring sky. On the further bank are more flowers, treated very formally and rather after the fashion of a tapestry design, the idea of the whole being to give a sense of decoration and not realism. The only words of direct advertisement appear in two panels in the border, which read "Travel and see it for yourself by 'General,'" and "Travel and see it for yourself by 'UndergrounD.'"

* * *

Mr. F. W. Ruffell, stationed at Nine Elms, London and South Western Railway, sends particulars of a new rail joint which he has patented. The joint is supported by a special chair—this is not a new feature—carried on two sleepers, with fish-plates on either side, shaped to suit the rail and fitted in the chair, these extending beyond the chair on either side and being connected by bolts passing through fish-plates and rail, and having countersunk heads on one side to allow of the usual wedges being driven in.

* * *

Mr. Malcolm M. Niven writes in reference to remarks concerning Glasgow and South Western Railway locomotives published last month that No. 11 still has the four cylinders, though otherwise rebuilt. He also mentions the death of a well-known main-line driver on this railway, Mr. David McKnight. He had No. 189 (4–4–0) for a considerable period, and recently had one of Mr. Manson's 4–6–0 engines. Mr. McKnight died early in March at his residence in Corkerhill. He retired some two years ago. He served under Mr. Stirling, Mr. Smellie and Mr. Manson. At one time he had charge of No. 78, the first engine to be fitted with an 8-wheeled tender. The death of Mr. McKnight completes a remarkable list of contemporary engine drivers. The following may be mentioned:—Mr. Robert Samson, 95; Mr. W. Mackenzie, 106; Mr. Thomas Fisher, 110; Mr. John McTurk, 187; and Mr. John McIntosh, 190. Mr. Samson, Mr. Mackenzie, Mr. McTurk and Mr. McIntosh have long ago passed away. Mr. Fisher is still at work, and recently Mr. Allen made allusion to him. These men worked Mr. Manson's 4–4–0's to and from Carlisle. In reference to Caledonian engine No. 913, recently illustrated on our cover, Mr. Niven mentions that although these engines were largely used until about two years ago on the Gourock section, including the first of the class, No. 909 *Sir James King* and another named *Barochan*, after Sir Charles Renshaw's estate in Renfrewshire, the class are not so numerous now, that section being at present mostly worked by "Dunalastairs" of the 721 class.



NEW FIRST-CLASS DINING CAR: MIDLAND RAILWAY.

In view of the leading article last month dealing with the Hotels, Refreshment Rooms and Restaurant Car Department of the Midland Railway, this view is of interest as amplifying the illustrations then given.

* * *

A reader cites a further instance of the unified working of British railways under present conditions. Recently he noted a wagon in a goods train on the main line of the Great Western Railway "sheeted" with tarpaulins belonging to two companies—the Great Western and the South Eastern and Chatham.

* * *

A Kentish reader states that recently on the Redhill-Reading section of the South Eastern and Chatham Railway he saw a London and South Western Railway troop

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train drawn by a Great Northern Railway 0–8–0 locomotive, No. 408. In view of the location the combination is decidedly unusual, and this is the first time we have heard of an eight-coupled engine being used in such a connection.

* * *

A SCOTTISH reader writes concerning the new North British Railway engines of the "Scott" class, pointing out that they are fitted with screw gear for reversing, operating horizontally direct on to the bridle rod lever. Most of the North British engines have screw gear, the Holmes engines, in particular, all having this type. Steam gear is used for the "Aberdonian" class, and the earlier "Scott" engines are so fitted also, though the later ones revert back to screw gear. In reference to 2–4–0 engines used on the Berwick and St. Bothwells route, he mentions that these were rebuilt in 1914 with Mr. Reid's type of cab and other changes. They are handy little locomotives. Nos. 1245 and 1246 are stationed at Duns.

* * *

A MEETING of the Institution of Locomotive Engineers was held on Saturday, March 25th, at Caxton Hall, Westminster, 2.30 p.m. Mr. C. F. Dendy Marshall, M.A., Member, read a paper on the "Dendy Marshall Four-cylinder Arrangement for Locomotives." The President, Mr. R. E. L. Maunsell, M.A., M.I.Mech.E., presided.

* * *

FIVE new engines are understood to be under construction for the Highland Railway. Three will be of the 4–6–0 type, almost identical with the "Castle" class, and the remaining two 4–4–0 engines. The 4–6–0 engines originally built for the Highland Railway, and transferred to the Caledonian Railway, bear numbers 938 to 943 inclusive. Two of these are stationed at Perth, and the others at St. Rollox. These engines have some novel features. They carry headlamps in three positions forward and the wing lamps at the cab sides (the latter being fixtures). The vacuum pipe at the forward buffer beam is swivelled and lies back on the footplate when not in use. The steps for mounting the tender at the back are hinged and are provided with snibs to hold them up when not in use. The new 4–4–2 superheater tanks on the North British Railway, are numbered 438 to 446 inclusive.

* * *

SINCE the commencement of the war a greatly increased interest has been taken in this country in the study of the French language. On the railways it is an almost daily experience to members of the staff to come in contact with refugees or other visitors to our shores, who are unable to speak English, and a conversational knowledge of French would be of much utility. This condition has led to an interesting innovation at Paddington station. A French class has been opened for members of the staff who, in the course of their duties, come into touch with the travelling public.

THE Great North of Scotland Railway has again issued the usual list of furnished lodgings, apartments, etc., at places served by its train service. Copies can be had on application to Mr. G. Davidson, General Manager, Aberdeen.

* * *

THE 20 4–6–0 passenger engines ("Prince of Wales" class), built by the North British Locomotive Co., Ltd., are now all in service on the London and North Western Railway. Of these 10 have been constructed at the Hyde Park Works, and the remaining 10 at the Queen's Park Works. The following list gives the running number, name, and shed number of these engines, the maker's numbers of which are 21256–21275 inclusive, in the order given:—

136	*Minerva*	Shed	15
173	*Livingstone*	,,	17
257	*Plynlimmon*	,,	15
446	*Pegasus*	,,	15
1749	*Precedent*	,,	15
2063	*Hibernia*	,,	15
2175	*Loadstone*	,,	15
2203	*Falstaff*	,,	15
2300	*Hotspur*		—
2392	*Caliban*		—
90	*Kestrel*	,,	1
401	*Zamiel*	,,	1
525	*Vulcan*	,,	15
610	*Albion*	,,	15
867	*Condor*	,,	8
1132	*Scott*	,,	15
1466	*Sphinx*	,,	15
1744	*Petrel*		—
2055	*Milton*		—
2339	*Samson*		—

No. 95 *Gallipoli* is the first of a new series of similar engines now under construction at Crewe. Recent withdrawals include a further two 5 ft. compound mixed-traffic engines (1400 class), Nos. 170 and 545; also the 6 ft. 6 in. "Jumbo" No. 1528 *Frobisher*.

* * *

THE March meeting of the series of operating department efficiency meetings was held at the London General Omnibus Company's Training School, Milman's Street, Chelsea, when a paper on "Safety First" was given by Mr. Percy Lane, of the claims department. There was an attendance of about 120 operating officers, invitations upon this occasion having been extended also to the tramways connected with the London and Suburban Traction group, whose claims work, together with that of the Underground Railways and the 'Bus Company, is now all handled by the one department. Mr. H. E. Blain, Operating Manager, presided, and amongst those present were: Messrs. J. P. Thomas (General Superintendent), H. Lansdown (Assistant General Superintendent), Capt. Rozier (Superintendent of Employment), S. Smith (Ticket Superintendent), of the London General Omnibus Co., Ltd.; Messrs. W. E. Blake (Superintendent of the Line), S. J. Webb (Passenger Agent), of the railways; Messrs. H. Dawson, R. Johnston, Newman, Lamprell (of

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the claims department); Messrs. A. H. Pott, of the London United and Metropolitan Electric Tramways; W. E. Hammond, of the Metropolitan Electric Tramways; A. V. Mason, of the South Metropolitan Tramways; and J. B. Mackinnon, of the London United Tramways. The paper was preceded by an exhibition of the London General Omnibus Company's training film.

* * *

NEGOTIATIONS are in progress between the North British, Caledonian, and Glasgow and South Western Railways whereby ordinary open goods and mineral wagons of these three companies will be brought under the common user.

* * *

FURTHER train service curtailments have been made by the North British Railway, principally in connection with Sunday trains. For example, on the Edinburgh and Dunbar section, the 8.34 a.m. train from Edinburgh to Dunbar and the 6.58 p.m. train from Dunbar to Edinburgh are withdrawn. On the Edinburgh and Hawick route, the 7.50 a.m. from Hawick to Edinburgh and the 4.54 p.m. from Edinburgh to Hawick are discontinued. On the Edinburgh and Kinross section, the 8.15 a.m. from Edinburgh to Kinross, and the return train, the 10.15 a.m. from Kinross to Edinburgh, do not run. On the Edinburgh and Glasgow line, the 6.12 a.m. train from Edinburgh to Glasgow and the 8.35 a.m. from Glasgow to Edinburgh are withdrawn; while on the Edinburgh, Peebles, and Galashiels section, and on the Selkirk, Kelso, and Jedburgh branches, all the Sunday trains are deleted from the service. On the Dundee and Tayport section, the 10.12 a.m. and 5.40 p.m. train from Tayport to Dundee and the 12.43 and 8.15 p.m. trains from Dundee to Tayport are discontinued.

* * *

WILLESDEN JUNCTION was opened in 1866, and has, therefore, attained its jubilee. Not many stations have passed through so many structural changes since, one of the most marked being the complete metamorphosis which altered the appearance of the High Level in 1894, when the "Broad Street and Mansion House" bridge over the main line was turned into an island platform and made suitable for both District and Richmond train services, the old Kew High Level being dispensed with, the bridge taken down, and new entrances supplied to fit the reconstruction. In addition the "New" portion of the station added when the special Watford lines were brought into use, has caused further changes.

* * *

MR. F. G. CRICK (Portmadoc), Traffic Manager and Accountant, Festiniog Railway, has retired after serving in that capacity for the long term of forty-four years. Mr. A. G. Crick, son of Mr. Crick, who is Secretary to the Company, has been appointed Traffic Superintendent in addition to the secretaryship, and Mr. R. Evans has been appointed accountant as well as audit clerk.

* * *

MR. WALTER H. HYDE, formerly General Manager, Great Eastern Railway, has been elected honorary secretary of the Retired Railway Officers' Society.

* * *

ON Friday (7.30 p.m.) and Saturday (2.30 p.m.), May 5th and 6th, at the King's Hall, Covent Garden, W.C., the London and North Western Railway Operatic and Dramatic Society will perform "Les Cloches de Corneville," proceeds to be devoted to Red Cross Funds. Particulars and tickets can be obtained from Mr. C. E. A. Howard, 7, Euston Square, London, N.W.

* * *

MR. W. H. COX, of Snaigow, Murthly, Perthshire, has been elected Chairman of the Highland Railway.

* * *

A MIDLAND RAILWAY 0–6–0 goods engine has been fitted with a Belpaire boiler as used for passenger locomotives.

MR. GRANT HALL, Vice-President and General Manager of the Canadian Pacific Railway, stated recently that in pursuance of the policy of encouraging the live-stock industry, the company will erect at country points in the West some 35 additional stock yards. At Moose Jaw a considerable expenditure will be made to add to the reservoir in connection with the water supply. At Regina a large amount of paving will be done around the freight sheds and team tracks. New ice houses will be constructed at Edmonton and Weyburn and some new stations on the line to Shaunavon. With a view to maintaining the road-bed in its present good condition over 150 miles of track will be relaid with heavy steel. It is also stated that in view of the financial outlook it has not been decided to proceed with the building of any new lines. The necessary money for the completion of Rogers Pass Tunnel has been allotted, and that work will be finished this year. With a view to maintaining the roadbed in good condition, more than 150 miles of track will be relaid with heavy rails, and there will be a considerable expenditure on ballasting, bank widening, and other work of that character.

* * *

OVER $108,000,000 has been invested in block signal systems in Canada and the United States. The railroads pay over $140,000,000 annually in taxes. There are approximately 1,900,000 railway employees in the United States and Canada.

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In spite of the war the Aga flashlight is still making rapid progress. The Swedish State Railways have now equipped all their distant-signals (about 825) with Aga flashlight, and are now putting flashlight on something over one hundred (100) semaphores. Altogether there will soon be nearly two thousand (2,000) flashlight signals in service in Sweden, and this is considered a record to be proud of.

* * *

The Bonaventure depôt, Montreal, Grand Trunk Railway, was recently burned down. The building was erected 35 years ago. The loss will probably amount to $300,000. Mr. Howard Kelly, Vice-President, Grand Trunk Railway, states that the fire was accidental, being caused by an electric dislocation in the stationery department. The station building was insured.

* * *

We regret to record the death of Capt. the Hon. Fred. Shaughnessy, son of Lord Shaughnessy. Capt. Shaughnessy spent several years in the Montreal offices of the Canadian Pacific Railway, to learn business methods, beginning at the bottom and working his way up on his own merits, despite the handicap that his father was President of the Company.

* * *

The Grand Trunk Pacific Railway uses oil on 700 miles of its track in Western Canada. To make this possible the company had to complete and set up oil plants at Jasper, McBride, Prince George, Endako, Smithers and Prince Rupert, B.C. Economy and the elimination of smoke and the greater safety of the forest ranges near the line were the reasons for this development.

* * *

The year 1915 was a most eventful period for the Canadian Northern Railway, their transcontinental line from coast to coast having been completed. Passenger and freight trains are now operated from Quebec, on the Atlantic, to Vancouver, on the Pacific Coast. The new line between Moncton, New Brunswick and Vancouver follows the shortest route to the Yellowhead Pass, where it crosses the main ridge of the Rocky Mountains at a maximum elevation of 3,711 ft. above sea level, proceeding through the pass within a few miles of Mount Robson, the highest peak of the Canadian Rockies.

A novel entitled "Hearts and Faces," dealing with the career of a young Scottish artist in London and Paris, is announced in John Lane's spring list. The author is John Murray Gibbon, General Publicity Agent of the Canadian Pacific Railway at Montreal, and formerly editor of *Black and White*. Mr. J. M. Gibbon was for several years Advertising Agent for the Canadian Pacific Railway in London, and has many friends in British railway circles. A Scotsman by birth, he has already written one popular book, entitled "Scots in Canada."

* * *

The Grand Trunk, Grand Trunk Pacific and National Transcontinental Railways have now a complete telegraphic system between Moncton, New Brunswick, and Prince Rupert, B.C.

* * *

The Great Indian Peninsula Railway have recently placed into traffic what is claimed to be the *first all-steel train* in India. Individual steel coaches have been built in several Indian railway workshops, but it is claimed that this is the first in India composed entirely of steel cars. The vehicles were shipped from England in parts and put together in the Matunga shops, the internal fittings being made at Matunga in accordance with the standard practice of the line. General design and appearance agrees with that of the usual standards, except that they are somewhat longer to compensate for increased tare.

* * *

The Russian Government has given the Baldwin Locomotive Works an order for 350 7-ton narrow-gauge gasolene locomotives. The French Government is reported to have ordered 2,000 freight cars from the Eastern Car Co., Ltd., New Glasgow, N.S. The Company is now completing an order for 1,000 cars for the French Government, the contract for which was made in June, 1915. These cars will be of material to C.P.R. specifications, with the exception of the screw coupling, drawbar hook and all springs, which are to a modified French specification suitable for American practice, especially regarding tests.

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Railway Literature.

THE SOUTH DOWNS. [Publicity Department, London, Brighton and South Coast Railway, London Bridge Station. Paper covers, 7d.; cloth covers, 1s. 3d. net.] Notwithstanding the set-back which literature has received during the war, the London, Brighton and South Coast Railway has issued this useful and attractive booklet, and the Publicity Department is to be congratulated thereon. The pseudonym of the author—who is described as "The Tramp"—covers the identity of a well-known topographical writer to whom perfect freedom was given, and the result is a serious contribution to the literature of Sussex and the South Downs. So few realise the delights of these magnificent Downs, which are within easy distance of nearly all the resorts served by the London, Brighton and South Coast Railway, and accessible at very reasonable fares seeing that the distances from London are never very considerable, that this booklet may be recommended as a guide for those wishing to spend a few days away from the worries of business and the anxieties of the war. There are six illustrations in colour, 14 reproductions of photographs, and two useful diagrams, one showing railway communications and the other various features of interest. The booklet is well printed and the text is interesting and readable throughout.

* * *

THE LOCOMOTIVE PUBLISHING CO., LTD., send a set of picture postcards, reproduced in colour, illustrating ambulance trains running on the respective railways. Those of the London and North Western, Great Central and Great Western Railways apply to trains for use here, and therefore include the characteristic liveries of the companies concerned. The Lancashire and Yorkshire and Caledonian trains are those supplied for service in France, each of 16 cars, and painted in khaki, while the sixth is the London, Brighton and South Coast Railway portion of the "Lord Michelham" or "Queen Mary" presentation train, also for service on the Continent. Except that the colour of the rolling stock of the Lancashire and Yorkshire and Caledonian trains is not very satisfactory, the reproductions are good. Trains are in each case headed by a main line engine, while appropriate surroundings are included.

* * *

RAILWAY CARRIAGE AND WAGON BUILDER'S POCKET BOOK AND DIARY: 1916. [The Locomotive Publishing Co., Ltd. Price 2s. 6d. net.] It is pointed out that the year 1915 has been an exceptional one for British railway carriage and wagon builders, as they have been called upon to depart largely from ordinary practice. Notable work has been accomplished in building new and converting existing rolling stock to meet the needs of the Army, for use both at home and on the Continent. Ambulance trains, horse transport, and motor wagons have been turned out from railway carriage and wagon shops all over the country, as well as many other articles for Army requirements, which are outside the usual scope of such works. There have been adaptations of existing wagon stock to meet military requirements. The mobilisation and equipment of an army has shown a demand for vehicles of certain types, and low floored machine trucks, cattle trucks, carriage trucks, both open and covered, large parcel and such vans, and carriages with a large carrying capacity have been found very useful. For these and similar reasons this useful pocket book and diary will commend itself to railway officers and employés of many grades. Contents include a large amount of data relating to, or likely to be useful in connection with, railway carriage and wagon construction.

* * *

PIONEER RAILWAY ENGINEERING. By Herbert Chatley, D.Sc. (Eng.), M.Inst.C.E. (I.). Price 4s. net. [The Technical Publishing Co., Ltd.] The author is Professor of Civil Engineering at the Tangshan Engineering College, North China. The matter consists essentially of the lectures on Railway Engineering delivered to the second and third year students of the Chinese Government Engineering College at Tangshan, North China. These are three sections, the first dealing with earthwork, the second permanent way, and the third rolling stock. A great deal of useful information is concisely presented, and the diagrams are well selected.

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THE RAILWAY MAGAZINE.

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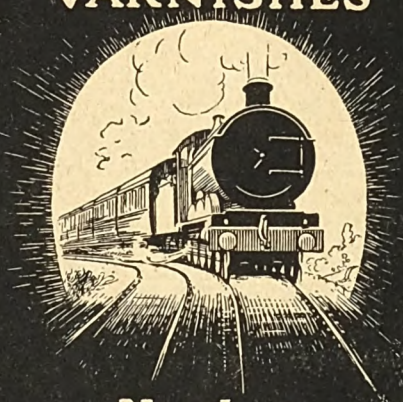

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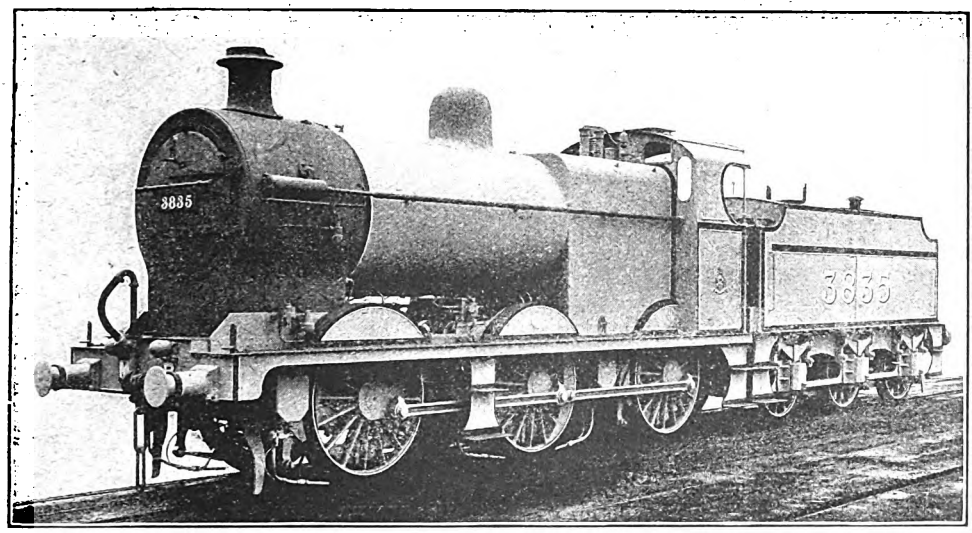

0–6–0 SUPERHEATER GOODS ENGINE NO. 3835, MIDLAND RAILWAY.
Of 7,384 0–6–0 tender locomotives in the United Kingdom the Midland Railway owns the highest individual total of 1,495 engines.

Some Locomotive Types of the Empire.

By J. F. GAIRNS.

A.—UNITED KINGDOM.

IN some respects it may be said that the study of locomotive types, as expressed by the now almost universal and so far unassailable numeral classification, epitomises the history of locomotive development. The four-wheeled era was a short one mainly because traffic conditions, principally in respect of speed, rendered four-wheeled engines unsuitable for development; but otherwise the progression of locomotive types becomes in effect a record of dimensional increases to meet extending traffic demands, reacting upon design by the fact that larger engines require more wheels to carry the weight and so cause one type to be replaced by another.

And even to-day, when the ten-wheeled era is so strongly in evidence, all the stages which have culminated in 4–4–2, 4–6–0 and 2–8–0 engines can be seen in existence, ranging from a few 0–4–0 tender engines—for the time being we are not concerned with tank engines—through the numerous 0–4–2 and 2–4–0 designs still doing good work, and the almost universal 0–6–0 type, to the 4–4–0, 2–6–0 and 0–8–0 designs, and so to the ten-wheeled classes mentioned. Indeed, it is only on lines where engineering considerations are prohibitive, or traffic demands have not yet rendered them necessary, that the more advanced types are not in use, and frequently in those cases more ordinary types have had to be developed to a degree that may legitimately be considered as justifying the introduction of ten-wheeled classes.

A considerable degree of engineering development is practicable without changing wheel-type, as shown by the relatively small 4–4–0's and 0–6–0's of 20 or so years ago and the large machines of corresponding types now used. In fact, there are considerable dimensional differences between various 4–4–2 and 4–6–0 designs in use. But there are limits to what can be done in this way, and just as the development of the 2–4–0 into the 4–4–0 type became imperative when once the limit was reached, so the 4–6–0 type has become the essential corollary to the 4–4–0 type, with the 4–4–2 type as a half-way measure.

Yet, while we may legitimately pride ourselves upon the "quality" of modern locomotive design, as evidenced by the load-hauling, speed-capacity, and traffic-suitability attributes of modern British locomotives; also in regard to the way in which demands are met without developing in the matter of dimensions to the extent which is seen in various parts of Europe, and also in America as far as comparable work is concerned; it is somewhat remarkable that

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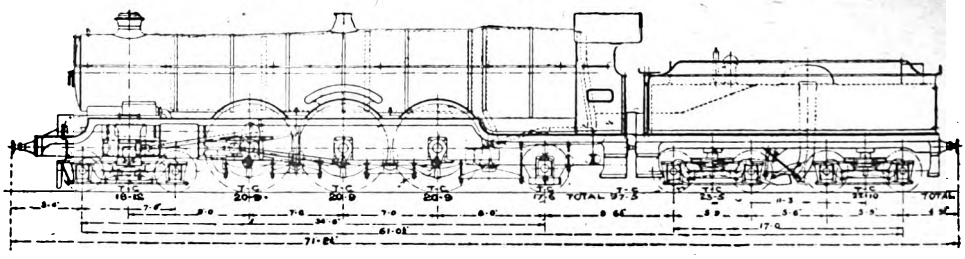
even at this advanced period ten-wheeled engines, though now fairly numerous, can still be considered as more or less exceptional.

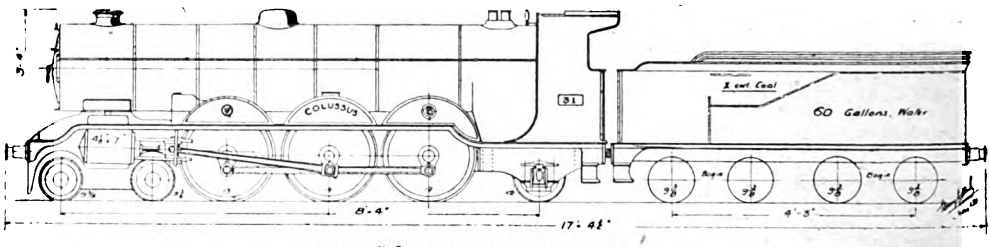
The study of statistics is never more useful than when it enables a correct impression of facts to be realised, and the necessarily exaggerated importance of particular items discounted to correct proportions; and in regard to locomotive types such a statistical study is specially useful, seeing that it is almost unavoidable that the more advanced types shall receive far more attention than is their due on a proportionate basis.

Mr. Allen, in his articles, has referred to many special performances on the part of relatively small engines; and it would be possible to instance many interesting records to the credit of even smaller classes, such as the 2–4–0 and 0–4–2 designs, were it not that they rarely take the trains which receive most timing attention, or when they get a chance to show their capabilities it so seldom happens that anyone travelling is available to take the necessary records. And in regard to numbers of such older and smaller engines a statistical study shows how greatly they out-number the modern engines of more advanced designs. Furthermore, relative numbers do not altogether explain themselves by the fact that the large engines are introduced with a view to the more arduous duties, the smaller engines working the far more numerous ordinary duties involved in railway traffic working; for, although this is correct in theory, in practice it is by no means unusual for smaller engines to tackle very difficult trains, and very creditably too, while the working out of train-working duties oftentimes gives the big engines relatively easy tasks.

Altogether, on the basis of the returns dated December 31st, 1915, there are 14,730 tender engines used within the limits of the United Kingdom. Of these Ireland claims 645 and Scotland 2,018, the remaining 12,067 applying to England and Wales. Incidentally, the returns show that in Ireland the Great Southern and Western Railway has the largest total—250 against the Great Northern record of 170, which takes second place; in Scotland the North British leads with 718, followed by the Caledonian with 602; and in England the Midland comes first with 2,259, the London and North Western second with 1,957, the Great Western third with 1,384, and the North Eastern fourth with 1,306. These figures take no account of tank engines, but as it is not proposed to discuss these in extended detail, it will be advisable, in order to correct any wrong impressions which may be obtained, to set forth the first and second positions in the case of Ireland and Scotland



NO. 111, *The Great Bear*, GREAT WESTERN RAILWAY.



THE *Colossus*, ESKDALE RAILWAY.
Great Western Railway (standard gauge) and Eskdale (narrow gauge, miniature type) "Pacific" locomotives.

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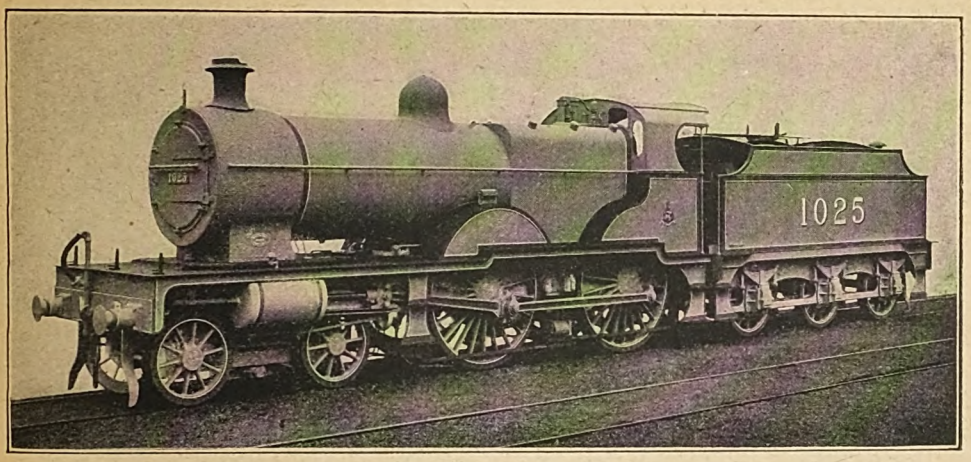


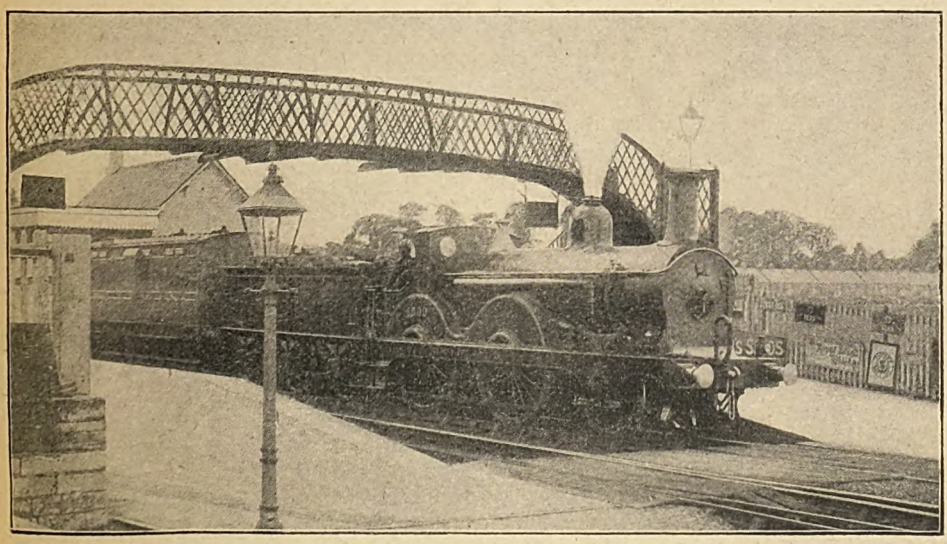
4–4–0 COMPOUND ENGINE, MIDLAND RAILWAY.
The Midland Railway owns 393 engines of the 4–4–0 type, the highest number on any one railway; total for type, 3,338.

and four positions for England, in regard to total locomotive stocks, as follows :—

	Tender engines.	Tank engines.	T'tls
Ireland.			
Great Southern and Western	250	71	321
Great Northern	170	34	204
Scotland.			
North British	718	336	1054
Caledonian	602	401	1003
England and Wales.			
Great Western	1384	1700	3084
London and North Western	1957	1094	3051
Midland	2259	754	3013
North Eastern	1306	683	1989

Altogether tank engines number, as nearly as can be ascertained in view of the numerous small lines, 9,988, making a grand total for all classes of 24,711 for the United Kingdom.

Returning, however, to tender engine classes, we find that although there are four 10-wheeled types in use and two 12-wheeled, these together account for only 1,335 engines out of the total of 14,730. Moreover, these are all found on only 18 out of the 39 railways which use tender engines, and of these 18 lines the Midland is only included on account of its one mysterious 2–6–2 engine,



Photo] [*E. W. Sargeant.*

2–4–0 ENGINE NO. 1800 (OLD NUMBERING), MIDLAND RAILWAY.
Of 926 engines of the 2–4–0 type, the Midland Railway owns 275.

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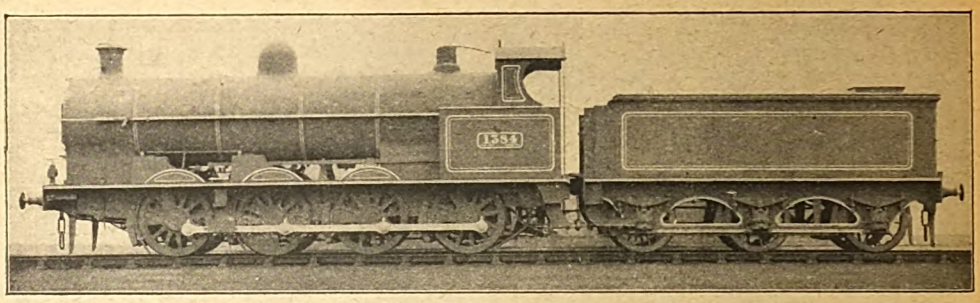
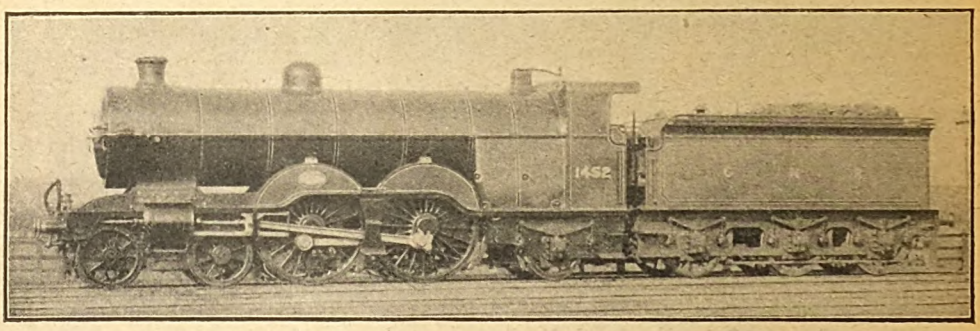
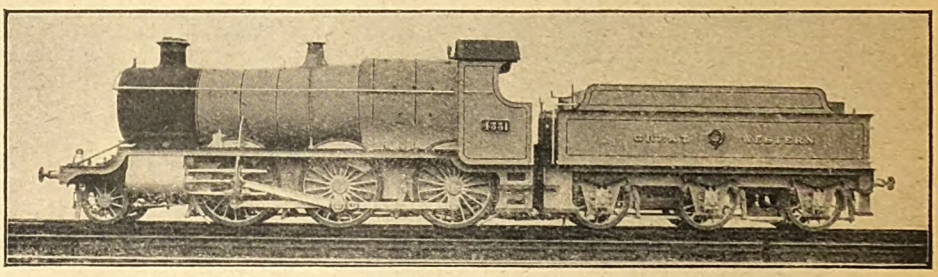


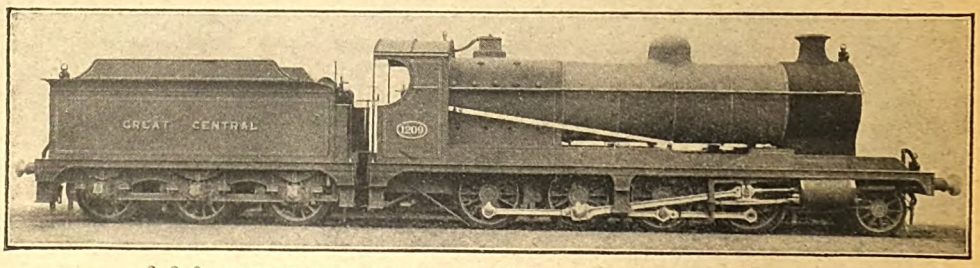
SUPERHEATER 0–8–0 MINERAL ENGINE, LONDON AND NORTH WESTERN RAILWAY.
406 0–8–0 engines (total 907) are owned by this line.



SUPERHEATER 4–4–2 ENGINE NO. 1452, GREAT NORTHERN RAILWAY.
116 locomotives of this type are owned by the Great Northern Railway, total 286.



2–6–0 ENGINE NO. 4331, GREAT WESTERN RAILWAY.
161 engines in service, total for type 214.



2–8–0 SUPERHEATER ENGINE NO. 1209, GREAT CENTRAL RAILWAY.
On this line 126 engines of this class are in service ; total for type, 229.

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the Londonderry and Lough Swilly by virtue of its two 4–8–0 engines, the Somerset and Dorset because of its six Derby-built 2–8–0's, and the Eskdale, which now ranks as a public railway, though of "miniature" type, with its 4–4–2 and 4–6–2 engines. Furthermore, eight others use only one of the ten- or twelve-wheeled types, leaving the Great Central, Great Northern, Great Western, Lancashire and Yorkshire, London and North Western and North Eastern as the only lines using two or more of such exceptional types. The following statement well sets forth the comparative figures for these types.

TEN-WHEELED TYPES.

(a) One only in use.

Caledonian	4–6–0	46	engines.
Glasgow and South Western ..	,,	19	,,
Great Eastern	,,	38	,,
Great Southern and Western ..	,,	6	,,
(These are goods engines, as the forthcoming express class is not yet complete).			
Highland	4–6–0	31	engines.
London and South Western ..	,,	36	,,
London, Brighton and South Coast	4–4–2	11	,,
Midland	2–6–2	1	engine.
North British	4–4–2	20	engines.
Somerset and Dorset Joint ..	2–8–0	6	,,
Total (10 lines)		214	,,

(b) Two types in use.

Great Northern	4–4–2	116	engines.
,, ...	2–8–0	5	,,
Lancashire and Yorkshire ..	4–6–0	20	,,
,, ...	4–4–2	40	,,
London and North Western ..	4–6–0	353	,,
,, ...	2–8–0	36	,,
North Eastern	4–6–0	65	,,
,, ...	4–4–2	64	,,
Total (4 lines)		699	,,

(c) Three types in use.

Great Central	4–6–0	53	engines.
,, ...	4–4–2	31	,,
,, ...	2–8–0	126	,,
Great Western	4–6–0	138	,,
,, ...	4–4–2	3	,,
,, ...	2–8–0	56	,,
Total (2 lines)		407	,,

TWELVE-WHEELED TYPES.

Great Western	4–6–2	1	engine.
Londonderry and Lough Swilly	4–8–0	2	engines.
Total (2 lines)		3	,,

To these might be added the one 4–4–2 and one 4–6–2 engines on the Eskdale Railway—referred to on another page—seeing that this miniature line now ranks as one dealing with public traffic, and for purposes of comparison diagrams of the Great Western and Eskdale "Pacifics" are given together, though, of course, drawn to very different scales.

It will, therefore, be seen that compared with such totals as 3,338 engines of the 4–4–0 types, and 7,384 of the 0–6–0 type, even such high totals as 805 4–6–0's and 907 0–8–0's are far behind in regard to extent of favour, whatever their importance in regard to engineering interest and working capabilities may be. Furthermore, even when more modern or "special" eight-wheeled types such as the 2–6–0 and 0–8–0 are considered, the situation is not greatly altered, seeing that there are still only 214 engines of the 2–6–0 type on eight lines, and the total of 907 of the 0–8–0 type is contributed by nine lines.

The following statement will render unnecessary a great deal of comment :—

2–6–2 type—1 engine. Midland.

4–8–0 type—2 engines. Londonderry and Lough Swilly.

4–6–2 type—2 engines. Great Western (1), Eskdale (1).

2–6–0 type—214 engines. Great Western (161), Great Northern (20), Glasgow and South Western (11), Great Southern and Western (11), Caledonian (5), London, Brighton and South Coast (5), Midland and South Western Junction (1).

2–8–0 type—229 engines. Great Central (126), Great Western (56), London and North Western (36), Great Northern (5).

4–4–2 type—286 engines: Great Northern (116), North Eastern (64), Lancashire and Yorkshire (40), Great Central (31), North British (20), London Brighton and South Coast (11), Great Western (3), Eskdale (1).

4–6–0 type—805 engines. London and North Western (353), Great Western (138), North Eastern (65), Great Central (53), Caledonian (46), Great Eastern (38), London and South Western (36), Highland (31), Lancashire and Yorkshire (20), Glasgow and South Western (19), Great Southern and Western (6).

0–8–0 type—907 engines. London and North Western (406), Lancashire and Yorkshire (210), North Eastern (120), Great Central (89), Great Northern (55), Hull and Barnsley (15), Caledonian (8), Barry (4).

Comparing these totals of types which can be termed "modern" with those of an earlier era it is interesting to note that even such relatively "out-of-date" types as the 4–2–2, 0–4–2 and 2–4–0 still provide considerable figures, 136 of the first mentioned (6 railways); 280 of the 0–4–2 type (7 lines) and no fewer than 926 of the 2–4–0 type (24 lines) remaining in service. The Midland

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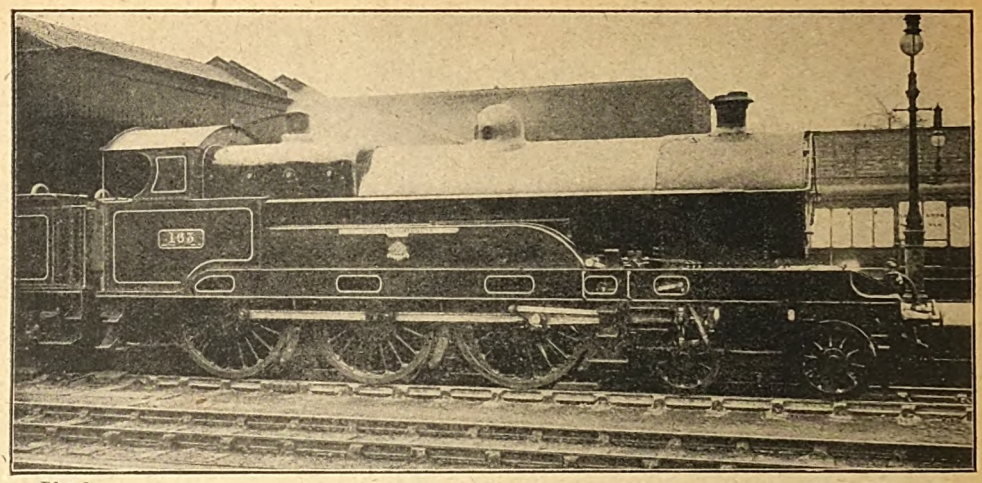
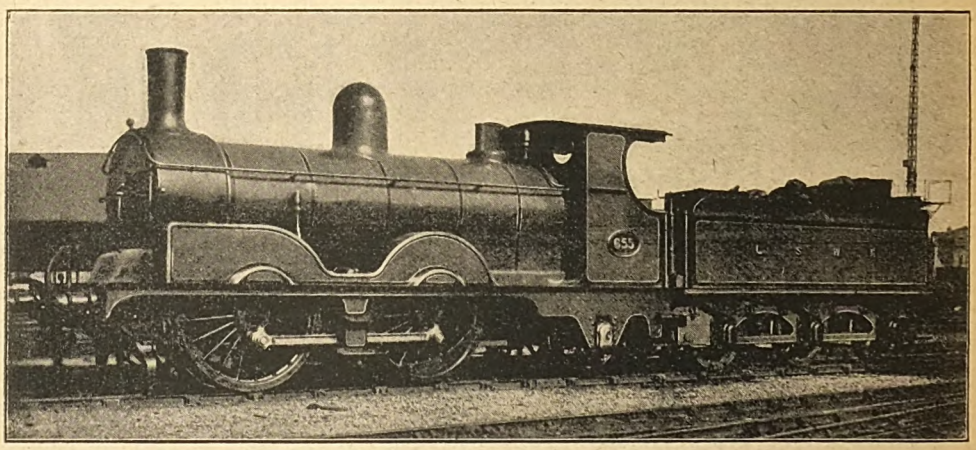
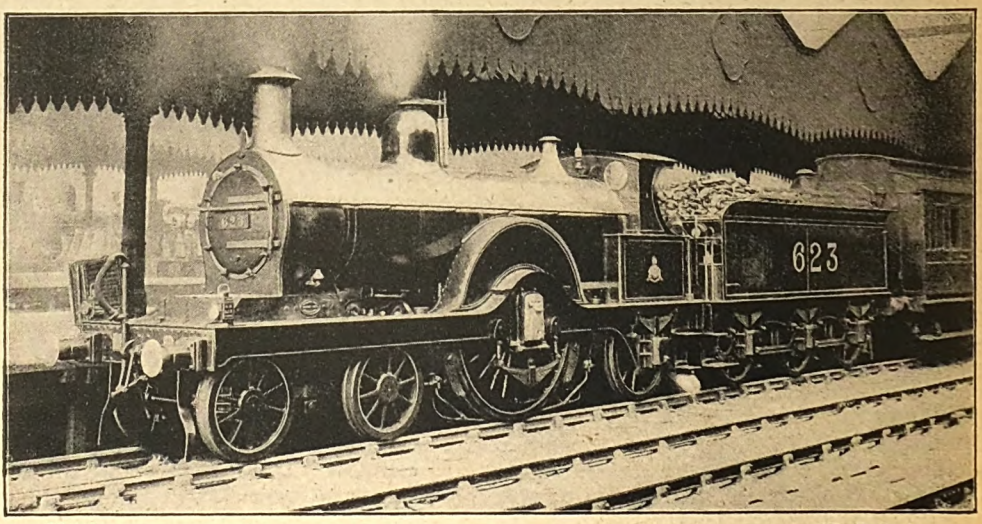


Photo] [*W. H. Whitworth.*

4–6–0 FOUR-CYLINDER ENGINE NO. 163 *Holland Hibbert*, LONDON AND NORTH WESTERN RAILWAY.
This railway has the largest number of 4–6–0 engines, 353 out of a total of 805.



0–4–2 ENGINE NO. 655, LONDON AND SOUTH WESTERN RAILWAY.
Of 280 engines of this type in service, the London and South Western Railway has 90.



Photo] [*P. F. Cooke.*

THE MIDLAND RLY. OWNS NO FEWER THAN 95 OF THE TOTAL OF 136 4–2 2 ENGINES STILL AT WORK.

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leads with 95 engines in the single class; also in the 2–4–0 class with 275; while the London and South Western has the highest total (90) for the 0–4–2 type.

In view of the fact that a number of railways could not yet deal with ten-wheeled engines on account of engineering restrictions or the character of the line in other respects, while on even the biggest lines there is very wide scope for engines of ordinary classes, it is not surprising that the 4–4–0 type should be the most numerous of the passenger classes, there being 3,338 engines on 25 lines. Furthermore, a considerable number of these are of essentially modern design, so that while many old engines are included, the type is in no sense a decadent one. The total of 7,384 goods engines of the 0–6–0 type, on 31 lines, calls for similar remarks, these including modern as well as old designs.

In closing this statistical study it will be of interest to note the highest figures recorded of the respective types, including a few special ones not hitherto mentioned individually.

Type.	Total.	Highest Railway Total.
4-6-2	2	G.W.R. (1), Eskdale (1).
2-6-2	1	M.R. (1).
4-8-0	2	Londonderry and Lough Swilly (2).
4-2-2-0	6	L. & S.W.R. (6).
These are the non-coupled four-cylinder engines of the 720 and 369 classes.		
0-4-0	14	Festiniog Railway (tank engines with tenders) (5).
4-2-2	136	M.R. (95).
2-6-0	214	G.W.R. (161).
2-8-0	229	G.C.R. (126).
0-4-2	280	L. & S.W.R. (90).
4-4-2	286	G.N.R. (116).
4-6-0	805	L. & N.W.R. (353).
0-8-0	907	L. & N.W.R. (406).
2-4-0	926	M.R. (275).
4-4-0	3338	M.R. (393).
0-6-0	7384	M.R. (1495).

In this connection reference may be made to the fact that for several years our valued weekly contemporary *The Railway News*, has published annually a series of articles analysing the official returns of rolling stock of all kinds, and while investigations for the present article have been made independently, a feature of the series mentioned has been the analyses of increases and decreases. These are of special interest in regard to tendencies of practice thereby indicated, and while, owing to the war, the evidence available in this way by comparing 1915 with 1914 returns is less conclusive than it would ordinarily be, it is worthy of note that except for unaltered totals for the 0–8–0 and 2–8–0 types, increases apply only to the modern 4–6–2, 4–6–0, 2–6–0 and 4–4–2 types and the ubiquitous 4–4–0 type; while the old types (4–2–2, 0–4–0, 0–4–2 and 2–4–0) together with the 0–6–0 type show decreases.

These increases and decreases may be noted in descending order:—

	1914 Totals.	1915 Totals.	Increase or Decrease.
4-4-0	3320	3338	+18
2-6-0	202	214	+12
4-4-2	276	286	+10
4-6-0	797	805	+8
4-6-2	1	2	+1
0-4-0	15	14	—1
4-2-2	141	136	—5
0-4-2	287	280	—7
2-4-0	962	926	—36
0-6-0	7448	7384	—64
All types	14794	14730	—64

It is practically certain that, had normal conditions continued, the 0–8–0 and 2–8–0 types would have witnessed increases also. Furthermore, the increase of 12 engines of the 2–6–0 class has to take into account the fact that during 1915 no fewer than 19 of the American 2–6–0's were withdrawn, the last having now disappeared, so that the actual increase figures for 1915 of new engines were: Great Western (20), Glasgow and South Western (11), total 31, though the American withdrawals reduce this to a total increase of 12 engines only.

B.—The Colonies, Dominions and Dependencies.

As our purview is not necessarily limited by the confines of the United Kingdom, it will be of interest to add a few remarks concerning the locomotive types of the Empire, though very briefly and without any attempt at similar exhaustive treatment.

The Dominion of Canada requires consideration quite independently seeing that its locomotives, in regard to design, dimensional possibilities and standards of traffic requirements accord more with American conditions. Consequently most of the modern locomotives compare with those of the United States, consisting mainly of 4–6–2 and a few 4–8–2 engines for heavy main line passenger traffic, 4–6–0's for general traffic, and 2–8–0 and 2–8–2 engines for freight traffic, features of practice and design being essentially American, and dimensions comparable with those of the adjacent Republic.

South Africa, too, is in somewhat of a special category seeing that while the usual gauge is only 3 ft. 6 in., design has been so

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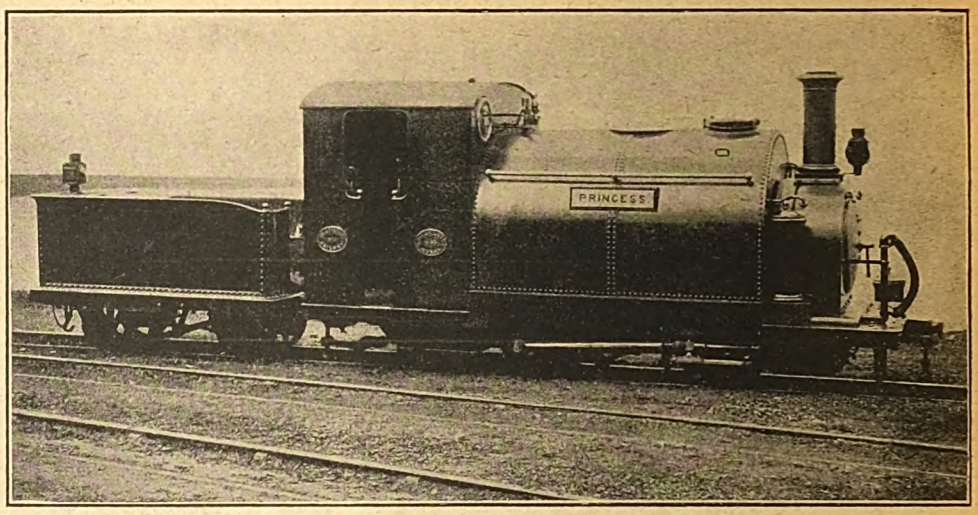
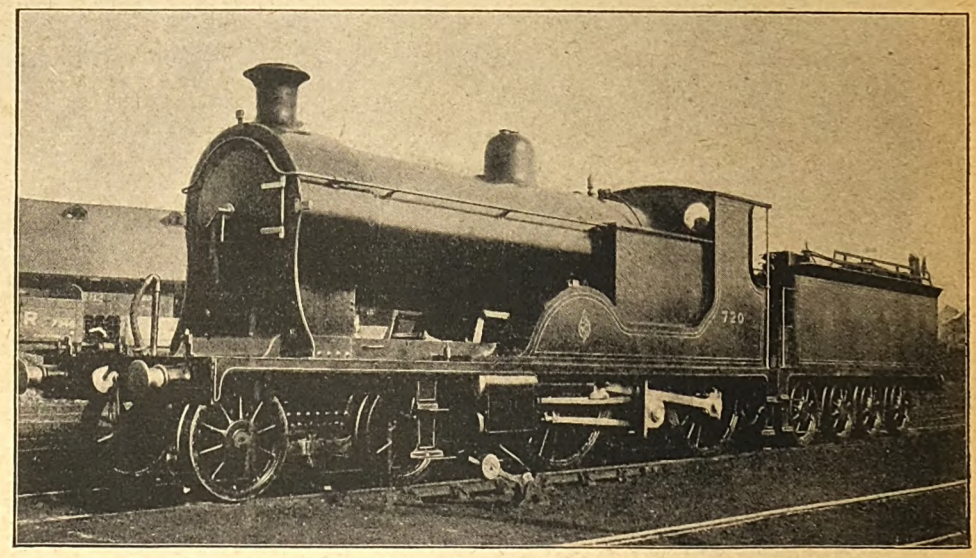


0–4–0 TANK ENGINE WITH TENDER, FESTINIOG RAILWAY.

developed that on this relatively narrow wheel-base engines are carried which in respect of dimensions and interest of design will compare favourably and on level terms with practice elsewhere on the 4 ft. 8½ in. gauge. There a 4–4–0, 4–6–0 or 2–8–0 engine is usually a relic of earlier days, and utilised only on lighter or specific services or on branches, while the standard engines are of the 4–6–2, 4–8–0 and 4–8–2 types with a few "Mallets" to indicate even more advanced tendencies. Indeed, one may say that the South African Government Railways call for the most advanced locomotive designs which are carried out in this country, the only exceptions, and then only partial, applying to a few special designs used in South America and in certain colonies.

India is, in the main, catered for by means of 4–6–0 and 2–8–0 engines, with a number of "Atlantics," and considerable totals of relatively advanced 4–4–0 and 0–6–0 designs. Dimensional possibilities allow of a degree



4–2–2–0 FOUR-CYLINDER ENGINE NO. 720, LONDON AND SOUTH WESTERN RAILWAY.

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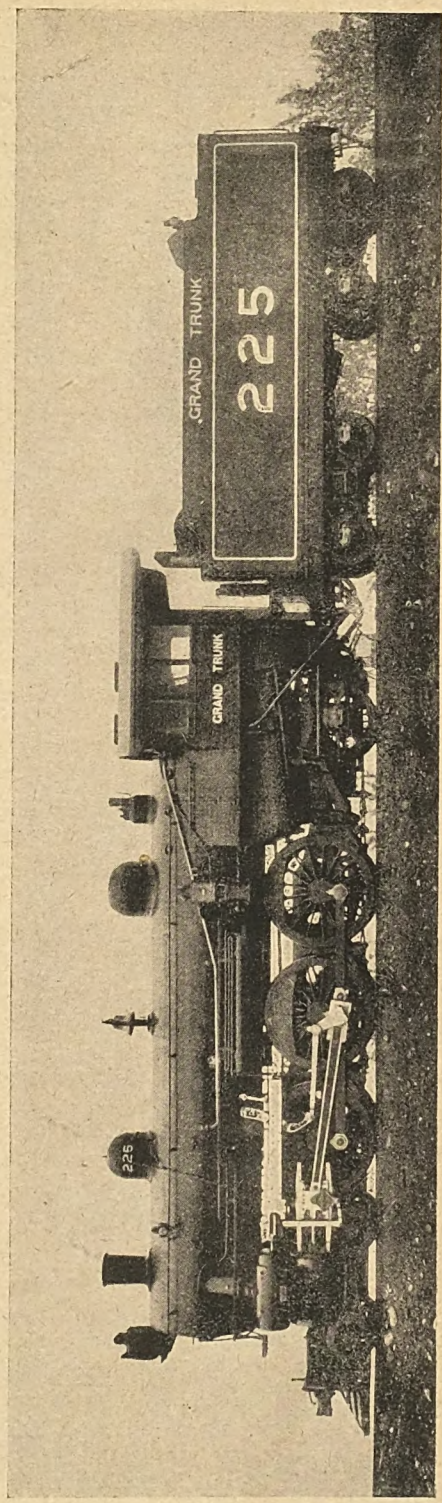
of development a little beyond that ordinarily practicable at home ; but on the whole there is much in common with that of British Railways. For specific duties articulated locomotives are employed, and on mountain sections certain heavy designs, usually tank engines, are in use.

Australasia includes a wide variety of 4–6–0 designs for traffic of all kinds, even the express engines being more akin to our "mixed traffic" classes in regard to coupled wheel diameters, this being a necessity of the heavy grades and traffic conditions which obtain. There are also numerous 2–8–0 engines, and a number of 4–8–0's ; but 4–4–0 and 0–6–0 engines are still fairly common for the ordinary duties. In Tasmania there are also the 4–4–2, 2–4–0 and 2–6–0–0–6–2 "Garratt" articulated designs, one of the former being illustrated by the courtesy of the Rev. J. S. Caddick-Adams.

Detailed particulars of numbers of engines of respective wheel-types are not available, so that this aspect cannot be discussed in the same way as home railway locomotives have been dealt with. It may be said that, speaking generally, the tendencies throughout India and the Australian Commonwealth are towards the 4–6–0 type for heavy passenger traffic, and with smaller wheels for mixed and ordinary goods traffic, with 2–8–0's for the heavy mineral and merchandise traffic. 4–8–0's constitute a useful type fairly common on narrow gauge lines, but exceptional on the standard gauge. On the whole, however, dimensions will compare well with those usual on the home railways, and in some cases the engines are rather smaller ; and there is still wide scope for the 4–4–0 and 0–6–0 types. Although the gauge in India is in many cases 5 ft. 6 in., and there are 5ft. 3in. lines in Australia, it can hardly be said that special advantage is yet taken of the additional possibilities thereby afforded as compared with home railway practice.

Tasmania and South Africa have called for development on more or less special lines, the engines in the former case including a number of relatively unusual and special lines, while in the latter case the terrific gradients, numerous curves and heavy traffic have produced a series of designs of extreme engineering interest, in order to enable traffic demands comparable to those of many ordinary gauge lines to be met on the 3 ft. 6 in. gauge.

Canada is again in a special category, and



4–6–2 ENGINE, GRAND TRUNK RAILWAY, CANADA.

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dimensional possibilities are there utilised very fully.

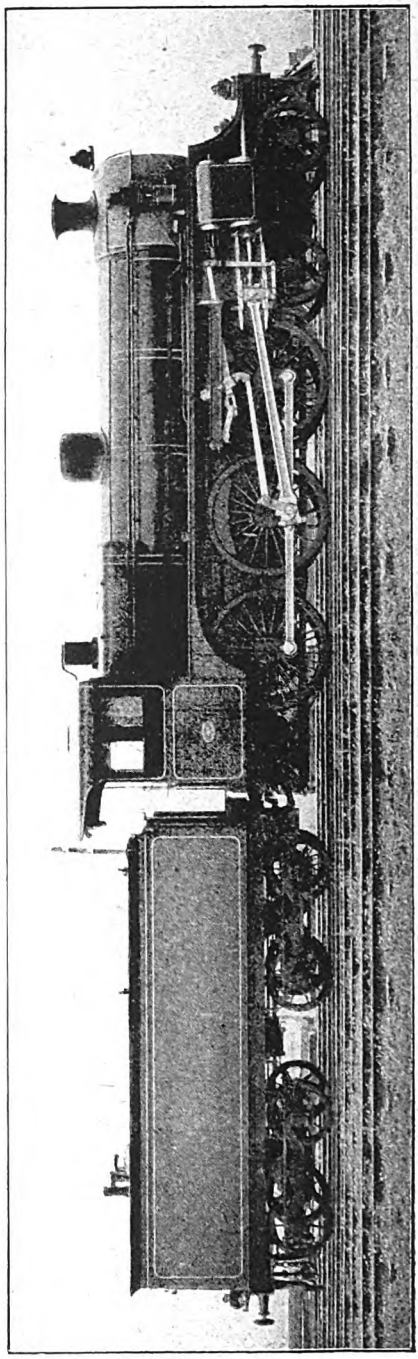
Most other parts of our great Empire are largely dependent upon railways of narrow gauge and relatively light construction, so that while 4–6–0, 4–6–2, 2–8–0, 2–8–2, 4–8–2 and "Mallet" designs are met with they are employed rather as suitable for obtaining sufficient power capabilities with restricted wheel load and distributed wheel-base than because demands have progressed beyond what would be practicable with ordinary types, were the road-bed and other conditions such as to permit of their development in the same way as at home.

Tank engines are not considered, but as they provide a wide field of subject matter, it is proposed to deal with them similarly on another occasion.

The following particulars of the three new Australian designs illustrated will be of interest. Alongside is shown a 4–6–0 class for the Victoria Government Railways, designed by Mr. W. M. Shannon, Chief Mechanical Engineer. This engine is of the present standard A2 class of heavy passenger and express engines, fitted with Walschaert valve gear and Robinson superheater.

Cylinders		21 in. × 26 in.
Coupled wheels		6 ft. 1 in. diam.
Bogie wheels		3 ft. 7 in. ,,
Coupled wheelbase.. ..		13 ft. 4 in. ,,
Total wheelbase		26 ft. 3 in. ,,
Steam pressure		165 lb. per sq. in.
Heating surface—	small tubes	721 sq. ft.
,,	large tubes	316 ,,
,,	fireboxes..	120 ,,
,,	superheater	335 ,,
		1,492 ,,
Grate area		22½ ,,
Weight of engine and tender in working order		117 tons

We are indebted to Mr. E. E. Lucy, Chief Mechanical Engineer, New South Wales Government Railways, for photographs and particulars of two notable locomotives design recently placed in service. These are illustrated on page 395. Both are superheater developments of classes already in use, but represent a considerable step forward, particularly in the case of the 4–6–0 class.



VICTORIA GOVERNMENT RAILWAYS.
A2 class, heavy passenger and express locomotive, fitted with Walschaert valve gear and Robinson superheater.
Designed by Mr. W. M. Shannon, Chief Mechanical Engineer.

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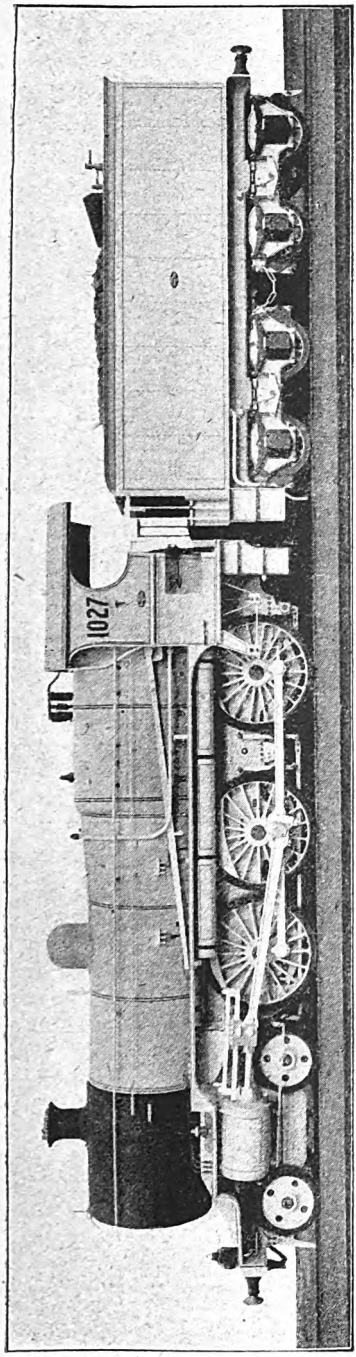
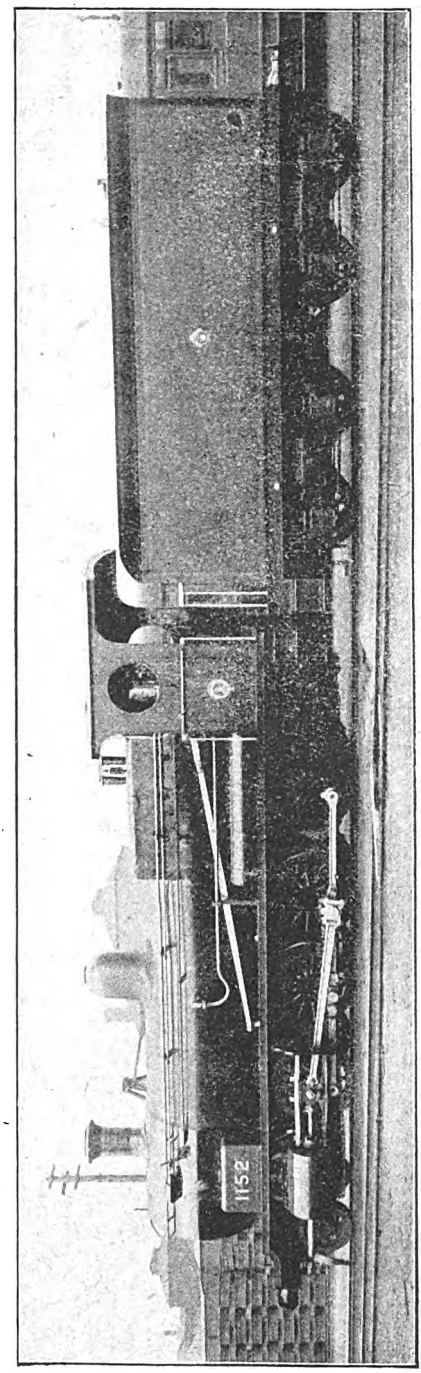


NEW SOUTH WALES GOVERNMENT RAILWAYS.
4–6–0 superheater engine No. 1027 (Class NN).
Designed by Mr. E. E. Lucy, Chief Mechanical Engineer.



NEW SOUTH WALES GOVERNMENT RAILWAYS.
2–8–0 Superheater Locomotive (Class TF).
Designed by Mr. E. E. Lucy, Chief Mechanical Engineer.

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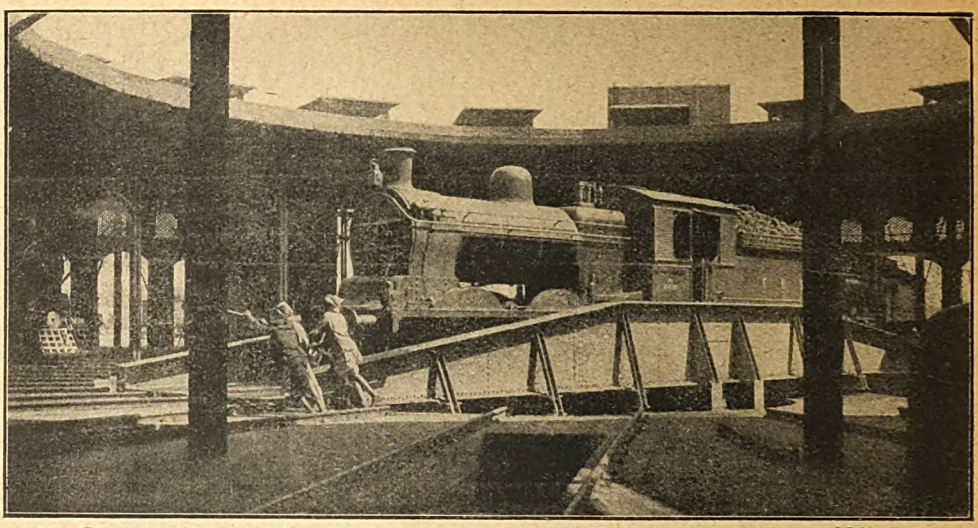
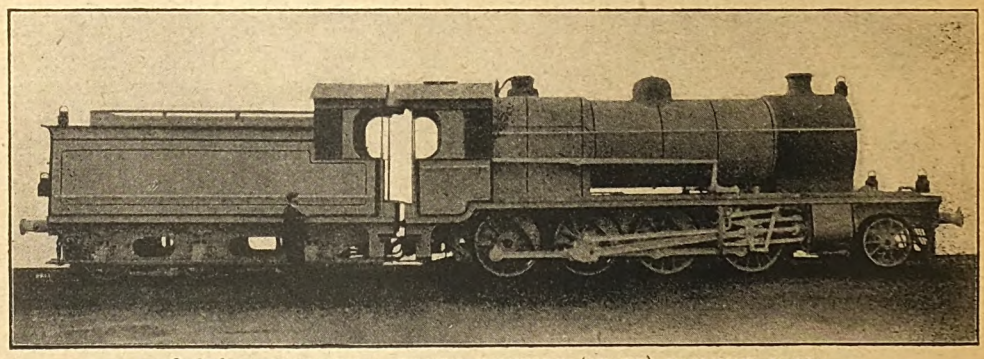
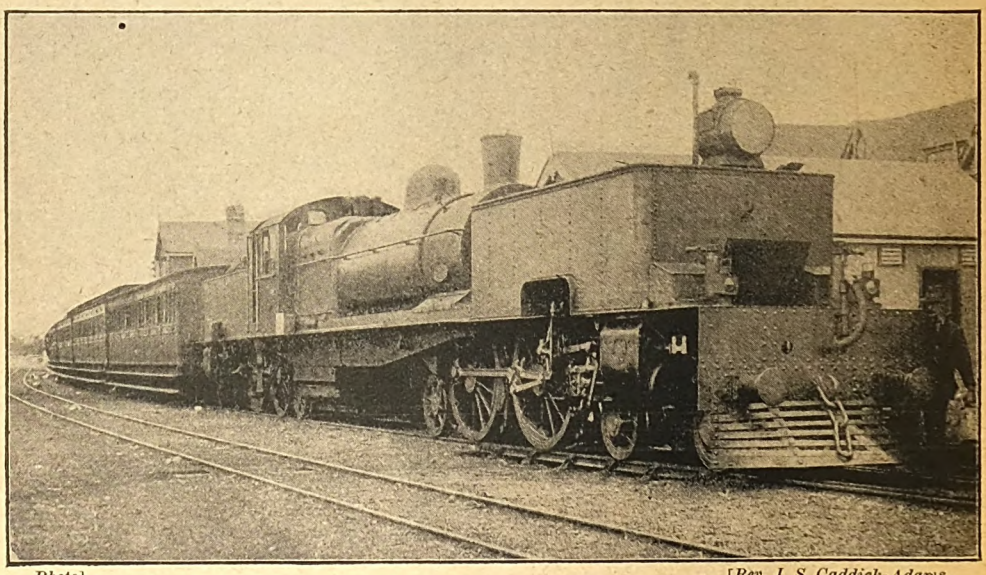


Photo] [*J.N. Scotter.*

EASTERN BENGAL RAILWAY.
0-6-0 superheater goods engine No. 296 on turntable at Chitpere running shed.



2-8-0 LOCOMOTIVE: NORTH WESTERN (STATE) RAILWAY, INDIA.



Photo] [*Rev. J. S. Caddick-Adams.*

TASMANIAN GOVERNMENT RAILWAY.
4-4-2-2-4-4 " Garratt " locomotive on Launceston-Hobart mail train.

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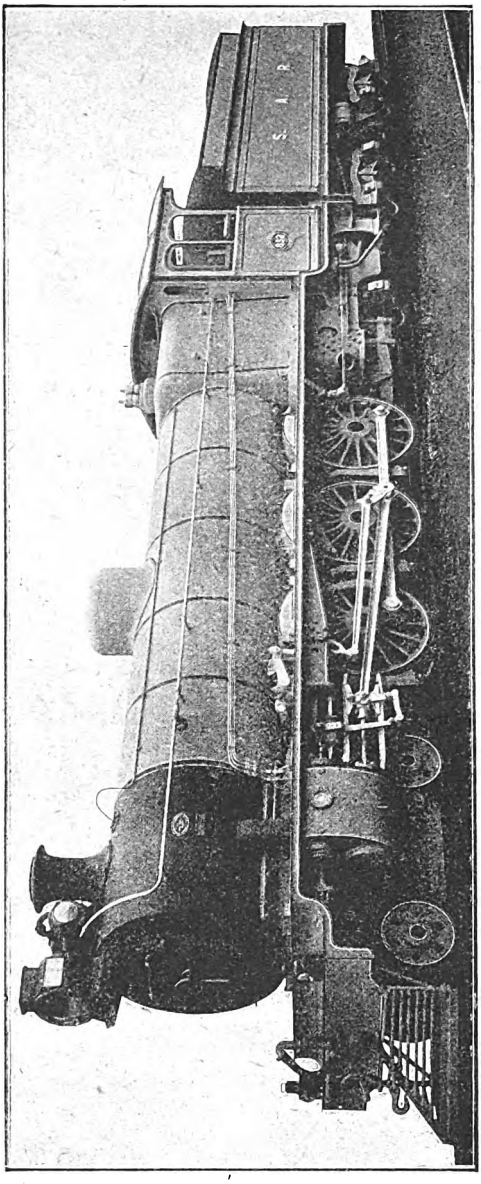
The 4–6–0 engines—class "NN"—are intended for heavy main line express and general passenger traffic. They are distinguished by the large Belpaire firebox, boiler barrel with taper ring, extended smokebox, and considerable dimensions in every respect. The heavy goods engines of class "TF" represent a powerful design. Forty of this class have the Eveleigh design of superheater; others have the Schmidt apparatus.

Leading dimensions of the two classes are as follows:—

	4–6–0	2–8–0
Cylinders ..	22½in. × 26in.	22in. × 26in.
Coupled wheels ..	5 ft. 9 in.	4 ft. 3 in.
Bogie or leading wheels	3 ft. 3 in.	2 ft. 9½ in.
Coupled wheelbase	14 ft. 0 in.	17 ft. 3 in.
Engine ,,	26 ft. 3½ in.	23 ft. 5 in.
Heating surface—		
Firebox ..	165 sq. ft.	174·4 sq. ft.
Tubes	2,040 sq. ft.	1,582·5 sq. ft.
Superheater ..	547 sq. ft.	446·4 sq. ft.
Total ..	2,752 sq. ft.	2,203·3 sq. ft.
Grate area ..	30·5 sq. ft.	28·75 sq. ft.
Tender capacity—		
Coal	9½ tons	6 tons
Water ..	4,000 gallons	3,650 gallons
Adhesion weight ..	57 ts. 19 c.	64 ts. 9 c.
Total weight of engine in working order ..	78 ts. 3 c.	71 ts. 7 c.
Total weight of tender loaded ..	46 ts. 11 c.	42 ts. 15 c.



4–6–2 ENGINE, SOUTH AFRICAN GOVERNMENT RAILWAYS (3 FT. 6 IN. GAUGE).

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The York and North Midland Railway.

[No. II.]

By H. H. MEIK.

The Burton Salmon and Knottingley Branch.

PROBABLY in the whole history of the railway world no line had so much effect in revolutionizing the railway communication between the North and South of England as did the Burton Salmon and Knottingley loop, the total length of which was only 2 miles 68 chains.

Prior to the opening of this loop travellers between London and York and the North had to go *viâ* Euston, Rugby, Derby and Normanton. The Act incorporating the Great Northern Railway (June 26th, 1846) authorised the construction of a line from Doncaster to York *viâ* Selby over practically the same line of country as the line subsequently constructed by the North Eastern Railway. Owing, however, to the state of the money market in 1847 the Directors decided to postpone the construction of that section of the line, with the exception of a small section, 4 miles 29 chains in length, between Doncaster and Askern Junction, which was opened on September 4th, 1848, in order to connect with the Knottingley and Askern Junction branch of the Wakefield, Pontefract and Goole (Yorkshire and Lancashire) Railway, over which the Great Northern had procured running powers in 1847 to Knottingley and Methley by a Contract under Seal. This last mentioned line, which was 10 miles 42 chains long, was opened in March, 1848. Originally there were no stations between Burton Salmon and Knottingley, the present station at Ferrybridge not being opened until the construction of the Swinton and Knottingley Joint line in July, 1879.

The York and North Midland Company, who were working in close relationship with the York, Newcastle and Berwick Company, in order to connect with the Great Northern Railway and also to provide an alternative route to London and the South of England, procured an Act dated July 9th, 1847, for a loop line from Burton Salmon to Knottingley. The line was of very easy construction, with the exception of a short tunnel near Brotherton and a tubular bridge, built by Robert Stephenson, across the river Aire between Brotherton and Ferry Fryston. It was opened for local traffic in April and for through traffic in August, 1850.

On August 8th, 1850, the Great Northern line was opened between London (Maiden Lane), and Peterborough, which, *viâ* Werrington Junction, Spalding, Boston and Lincoln to Sykes Junction and by means of running powers over the then Manchester, Sheffield and Lincolnshire Railway from Sykes Junction to Retford, gave them an access to Askern Junction and from that place a through communication between London, York and the North.

The Great Northern Company, having practically abandoned the Selby route to York, entered into a treaty with the York and North Midland Company whereby they procured running powers from Knottingley into York with the use of the latter station.

In return for the privilege of exercising running powers into York the Great Northern Company undertook not to construct their Askern and York line, which was then in abeyance, so that to this day the main line northern limit of the Great Northern Railway ended, that is if the statement then made can be relied on, in a ploughed field four miles north of Doncaster.* The result of these arrangements was that in September, 1850, a through connection was established between London and Edinburgh, whereby first class passengers were enabled to perform the journey in 12 hours.

It may be mentioned here that although the Great Northern Company under their undertaking did not construct the Shaftholme and York direct line, the North Eastern Railway procured an Act dated June 24th, 1864, which enabled them to construct the line, which was opened on January 2nd, 1870. The Act gave the Great

* *Note.*—For further details concerning the Doncaster and York lines, readers are referred to "The East Coast Route—London to York Section" (Railway Magazine, Vol. 17, pp. 143 and 209, August and September, 1905).

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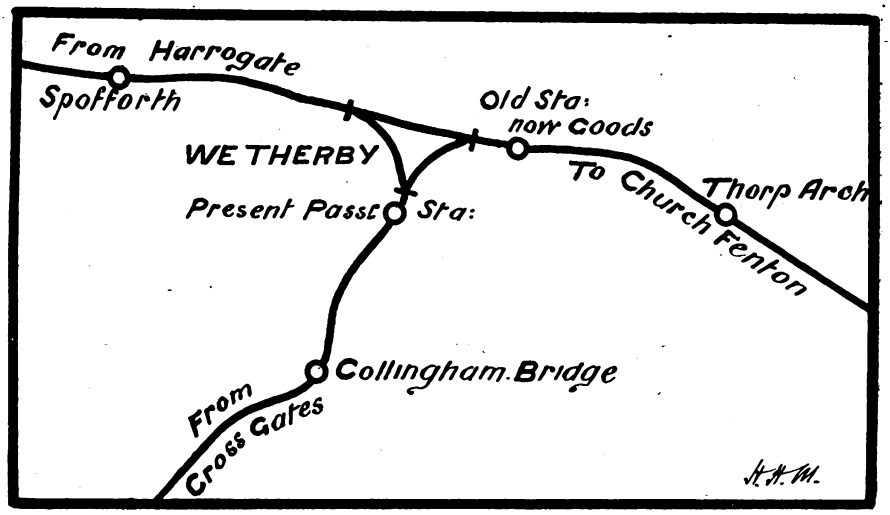

ORIGINAL AND PRESENT STATION AT WETHERBY.

Northern Company a preferential user over the line into York and at the same time prohibited the North Eastern Company from using their running powers over the section between Shaftholme Junction and Doncaster, in so far as fast trains were concerned which would compete with the Southern Company's through expresses.

In June, 1853, there were *viâ* Knottingley and Doncaster five first and second class trains on week-days and two on Sundays and also one third class train on week-days from York to King's Cross, while from King's Cross to York there were four first and second class and one third class train on week-days and one first, second and third class train on Sundays.

The quickest up train took 5 hours and 20 minutes to cover the journey, while the corresponding down train only took 4 hours and 50 minutes.

Annexed is a condensed table of times :—

DOWN TRAINS.

Leave.	Week-days.						Sundays.
	a.m. 1, 2, 3.	a.m. 1, 2, 3.	a.m. 1, 2, 3.	a.m. Exp.	a.m. 1 & 2.	p.m. 1 & 2.	a.m. 1, 2 & 3.
King's Cross	—	—	7. 0	9.30	10.30	5. 0	7.30
Peterboro'	—	6.10	10.25	11.15	12.50	7.10	11.10
Retford	—	9. 0	1.20	12.35	3. 0	9. 0	2.40
Doncaster	7. 5	9.50	2.15	1.25	3.40	9.30	3.30
Knottingley	7.50	11.20*	3. 5	1.53	4.15	10. 0	4.15
York .. .. .. arr.	8.50	11.20	4.20	2.20	5.10	10.45	5.10

* *sic* evidently a misprint for 10.20.

UP TRAINS.

Leave.	Week-days.						Sundays.	
	a.m. 1 & 2.	a.m. 1 & 2.	a.m. 3rd Cl.	p.m. 1 & 2.	p.m. 1 & 2.	p.m. 1 & 2.	a.m. 1 & 2.	p.m. 1 & 2.
York	7.20	9.50	11. 0	12.30	4.10	8.40	9.45	8.40
Knottingley ..	8.20	10.50	Intermediate times not given.	1.10	4.42	9.25	10.35	9.25
Doncaster	9. 5	11.29		1.45	5.10	10.15	11.20	10.15
Retford	9.55	11.50		2.20	5.38	11. 0	12.15	11. 0
Peterboro'	1. 5	1.40		4.40	7.20	1.10	3.30	1.10
King's Cross arr.	5. 0	4. 0	7.30	7.30	9.30	4. 0	7.20	4. 0

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Extensions made by the York and North Midland Railway.

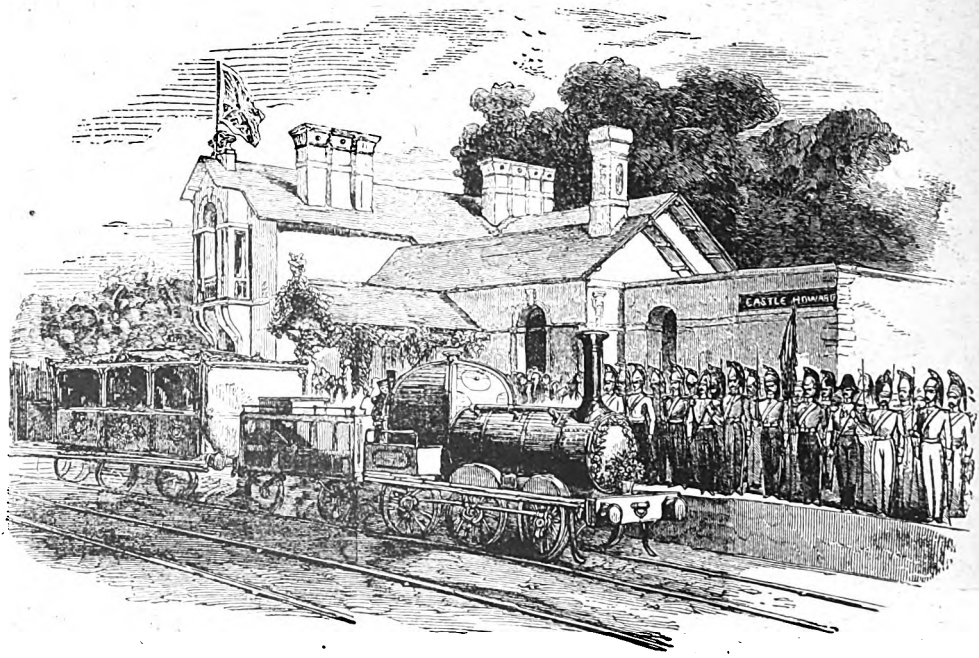
The York and Scarborough Line.

A project for a line between York and Scarborough appears to have been promoted by a separate Company in 1842, but from various reasons the scheme fell through. The idea was adopted by the York and North Midland Railway and the Directors stated at a half-yearly meeting held at York on August 4th, 1843 (George Hudson in the chair), that some time since they had been authorised to make a survey with a view of forming a railway from York to Scarborough. The survey was completed in 1841, but further proceedings were postponed in favour of completing the line between Darlington and Newcastle, which had since been done, and the Directors proposed to proceed with the line, having obtained an estimate of the cost. It was proposed to lay down a single line of rails only, with sidings or crossings at Walton, and also to cross turnpike roads on the level. Estimated cost, including construction, stock and stations, etc., was £260,000. (This included coaches, engines and every other outlay.) The Chairman stated that it was proposed to cross the Ouse at York by a wooden bridge. This was eventually changed to an iron bridge, as stated further on.

At another meeting, held at York on November 17th, 1843, it was resolved that the Directors should be authorised to apply to Parliament next session for powers to make a line from York to Scarborough, with a branch to Pickering "as an extension of the York and North Midland Railway and to raise an additional capital of £260,000." The Bill for the line was duly lodged in Parliament and received Royal Assent on July 4th, 1844.

At a half-yearly meeting held at York on February 4th, 1845, the Directors "determined to lay down a double set of rails to the junction for Pickering" (Rillington Junction), "which was desirable on account of the intended extension of the line to Bridlington and the purchase of the Whitby and Pickering Railway."

The length of the line from the present York station to Scarborough is 41 miles 79 chains and the Rillington and Pickering branch 6 miles 48 chains. It commenced at a junction with the Great North of England Railway about half a mile north of the original York station. This junction was



ARRIVAL OF HER LATE MAJESTY QUEEN VICTORIA AT CASTLE HOWARD STATION.
From *The Illustrated London News*, August 31st, 1850.

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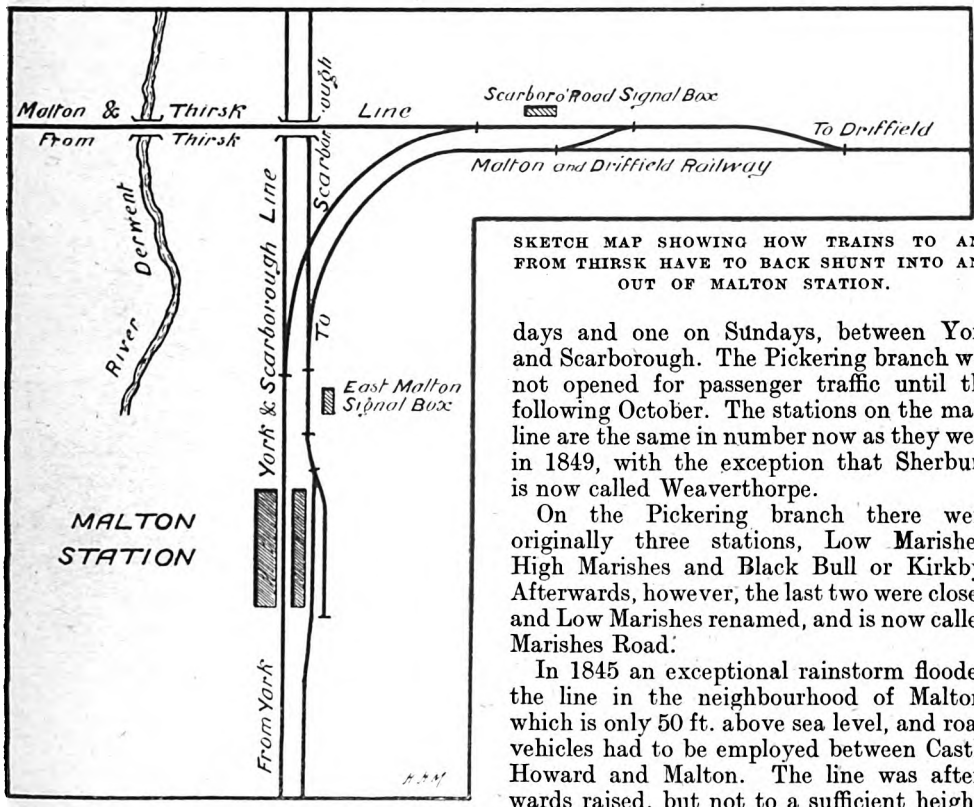
made facing northwards and on the north side of the Great North of England Company's coal branch, as that Company objected to their line being crossed on the level. The result was that the Scarborough and Pickering trains had to be both backed into and out of York terminus, a very awkward proceeding.

The principal engineering works were the viaducts over the Ouse at York and the Derwent at Hutton. The former river was crossed very soon after leaving the junction with the Great North of England line. It consisted of two spans, the girders of which were of cast iron, each being of 75 ft. span. The centre pier was founded on piles driven into the bed of the river, the piers and abutments being of masonry. It also afforded communication for foot passengers between the two sets of rails. The bridge over the Derwent was a timber bridge about 400 ft. long with 50 ft. arches. There was also near Scarborough an embankment with a brick viaduct of five arches 45 ft. high. The two last mentioned bridges were rebuilt about the year 1867. The line other than above described passed through a comparatively level country and was fairly straight, with the exception of that portion between Barton Hill and Hutton, which was of the nature of an S curve. The line was constructed at a very rapid rate and was opened on July 5th, 1845, and cost under £6,000 per mile. The station at Malton consisted of one platform just long enough to accommodate four or five four-wheel coaches.

In August of the year of opening the traffic consisted of four trains each way on week-



SKETCH MAP SHOWING HOW TRAINS TO AND FROM THIRSK HAVE TO BACK SHUNT INTO AND OUT OF MALTON STATION.

days and one on Sundays, between York and Scarborough. The Pickering branch was not opened for passenger traffic until the following October. The stations on the main line are the same in number now as they were in 1849, with the exception that Sherburn is now called Weaverthorpe.

On the Pickering branch there were originally three stations, Low Marishes, High Marishes and Black Bull or Kirkby. Afterwards, however, the last two were closed and Low Marishes renamed, and is now called Marishes Road.

In 1845 an exceptional rainstorm flooded the line in the neighbourhood of Malton, which is only 50 ft. above sea level, and road vehicles had to be employed between Castle Howard and Malton. The line was afterwards raised, but not to a sufficient height, as in 1878 the line was for a time more than a foot under water, and again in 1911 near Castle Howard station a thunderstorm washed away the ballast and left the rails and sleepers hanging in the air.

In August, 1850, Queen Victoria paid a visit to the Earl of Carlisle at Castle Howard and an accompanying illustration shows her arrival at the station.

The Seamer, Filey and Bridlington Line.

The Act for this line was obtained on June 30th, 1845, and it was opened to Filey on October 5th, 1846, and to Bridlington on

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October 18th, 1847, where it terminated at the Hull and Selby (Bridlington branch) station, which had been opened on October 6th, 1846.

Distance from Seamer Junction to Filey is 6 miles 10 chains and to Bridlington 19 miles 43 chains. The stations are the same now in number and name as they were in 1849, with the exception that Flamborough was originally called "Marton (for Flamborough)."

At the inception of the line the only places of any importance on the line were Filey and Hunmanby. In September, 1849, there were four through stopping trains each way on week-days between Scarborough and Bridlington and one on Sundays. In June, 1853, there were still only four through stopping trains on week-days and one on Sundays, the quickest train both ways taking 70 minutes, one train each way being first, second and Government, the others being first, second and third class only.

In the beginning of 1850 it was announced in a periodical of that time that "the Company" (York and North Midland Railway) "had commenced, at the Port of Bridlington, measuring for the extension of the railway on the new pier with the intention of shipping coals." The project, however, never developed.

THE CHURCH FENTON AND HARROGATE LINE.

This line was originally projected by an independent Company in the summer of 1843 as a single line and to run from Harrogate *viâ* Knaresboro' and Tadcaster to Bolton Percy. The Company held out in their Prospectus the prospects of a return of 11 per cent. on the capital to be subscribed. Their case before Parliament showed as follows :—

Estimated cost of line ..	£150,000
,, revenue	20,000
Working expenses	8,000

Profit per annum being equal to 8 per cent. on the capital.

From imperfections in the case before Parliament the Bill was thrown out in Committee and the Company dissolved.

As it would appear, some of the shareholders of the York and North Midland Company were desirous that the line should be taken up and this having been done, the project might be considered to have emanated from the shareholders rather than from the Directors.

A Bill was lodged in Parliament in the Autumn of 1844 for the construction of a double line of railway from Low Harrogate to Church Fenton, the line being diverted from the route of the original scheme at Tadcaster, so as to join the main line of the York and North Midland Railway at Church Fenton instead of Bolton Percy.

The Bill received Royal Assent on July 21st, 1845, and the line was opened from Church Fenton to Spofforth on August 11th, 1847, and to Low Harrogate on July 20th, 1848.

The capital authorised for the construction of the line was £306,177, and the actual outlay up to the end of October, 1849, was £607,000, and owing to other competing routes the traffic was only £10,557 instead of £20,000 per annum, while the expenses were £7,821, or as much as they would have been had the traffic been double.

The line crossed the Crimple Valley on the south-east of Harrogate by a brick viaduct with stone facings of 31 arches, each with a span of 50 ft. The height of the viaduct from the ground at its deepest part was 120 ft. About a quarter of a mile south-east of the viaduct is the Prospect Tunnel, the only one on the line, situated about the middle of a long gradient averaging about 1 in 90.

At first there was no proper station at the Harrogate end, a temporary one only being erected at the time and this still remained in use in 1849. Afterwards the station became known as the Brunswick station, now abandoned. The stations between Harrogate and Church Fenton are the same now as they were in 1849, except that Stutton has been closed for some years. The original Church Fenton station on the York and North Midland line was opened on the same date as the line itself. It was rebuilt and opened in its present form in September, 1904.

Wetherby was originally only a roadside station, but was closed for passenger traffic in July, 1901 (the site has since then been used as a goods station), when the line from Leeds *viâ* Bardsea and Collingham was doubled, and transferred to its present site as shown on the accompanying map.

In September, 1849, there were four stopping trains from Church Fenton and three from Harrogate on week-days (none on Sundays), the quickest train being the 2.30 p.m. from Harrogate, which took 45 minutes for the journey.

In June, 1853, there were three stopping trains each way on week-days (none on Sundays), the quickest being that from Harrogate at 2.40 p.m., which took 42 minutes for the journey.

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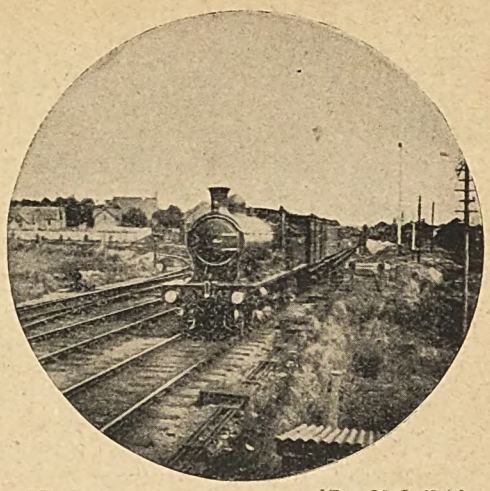
British Locomotive Practice and Performance.

By CECIL J. ALLEN.



Photo] [*Tom M. L. Neish.*

HIGHLAND RAILWAY.
2.30 a.m. Wick–Perth Sunday mail train leaving Kingussie.
4–6–0 locomotive No. 147, *Beaufort Castle.*

DURING the course of the last twelve months I have had occasion to travel frequently by the 2.20 p.m. Anglo-Scottish express *ex*-King's Cross, and it has been my intention for some time past to give a tabular statement of a number of these runs as illustrative of heavy express work on the Great Northern Railway. This afternoon express has, since the commencement of the war, become increasingly popular, while the cancellation of the 1.30 p.m. from St. Pancras has doubtless added a further quota to the number of its passengers. Thus, whereas in pre-war days the total load was usually in the neighbourhood of 40 axles, it is now never less than 50, and often more in the neighbourhood of 60 pairs of wheels. This includes a portion which is detached at Newcastle, consisting of a welcome addition to the first-class accommodation in the shape of an empty first-class dining car (for the 10.28 a.m. from Newcastle to London the next day), an additional brake and one or two corridor vehicles for the use of service men. These remarks were penned, needless to say, before the withdrawal of restaurant cars that took place on May 1st. Therefore although the time allowed for the 105·5 miles from King's Cross to Grantham is 122 min., and for the 82·7 miles thence to York 97 min.—representing average speeds as moderate as 51·9 and 51·2 m.p.h. respectively—the task required of the locomotives is not altogether so easy as it might appear on paper. For the gradients of the Great Northern main line, while not exceptionally steep, save at the start, are decidedly arduous in parts when the loads hauled are of this magnitude.

It may be well first to devote attention briefly to these gradients, as they have so important a bearing on the running times. Doubtless these are quite familiar to many readers, but they will perhaps pardon the digression for the sake of those who are not so well informed. From King's Cross the start is a difficult one. After a bare $\frac{1}{4}$-mile of level track there is an ascent of nearly $1\frac{1}{2}$ miles at 1 in 105–110 through Maiden Lane and Copenhagen Tunnels, and the invariably greasy state of the rails here is often productive of slipping. A level stretch ensues to just before Finsbury Park, followed by a slight rise at 1 in 400 to Harringay; from that point a descent of 1 mile at 1 in 264 to near Wood Green offers some assistance to the climbing of the continuous $8\frac{1}{4}$ miles at 1 in 200 which culminates at Potters Bar. There are now nearly 6 miles of falling gradients, to a point $\frac{3}{4}$-mile beyond Hatfield, where the River Lea is crossed; only two of these are at 1 in 200, however, the remainder being at easier inclinations. A further 5 miles' ascent at 1 in 200, broken only by a mile of downhill and level over Welwyn Viaduct, brings us to Woolmer Green, a mile before Knebworth, and the highest point on this section of the line. After $2\frac{1}{2}$ miles downhill Langley is reached, where the new line from Enfield converges, and where a vexatious permanent way caution was in force for months during the construction of the underline bridgework for the burrowing junction; while the subsequent $1\frac{1}{4}$ miles up

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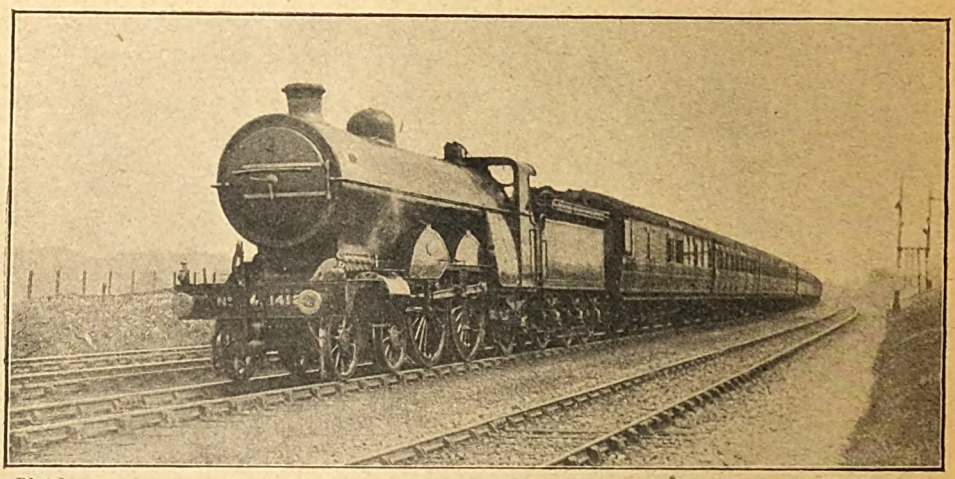
at 1 in 330 to Stevenage was of no assistance to heavy trains in recovering from the slack, while it was in force. But from Stevenage to Huntingdon, a distance of 30 miles, there extends one of the finest "racing-grounds" in the kingdom. Of this the initial 5 miles past Hitchin are at 1 in 200, followed by 3½ miles at 1 in 264 and 400; then, after a brief uphill and level mile beyond Arlesey, the fall is renewed at 1 in 264 and 330 to Biggleswade. Beyond that point there are very slight undulations, the most noteworthy of which is the 3¾ miles' ascent at 1 in 330 to St. Neot's, broken midway by ¾-mile downhill at 1 in 200–264. From St. Neot's there is a mile down at 1 in 200, followed by 2¼ miles at 1 in 579 to the banks of the Ouse.

ascent on the line, which extends continuously to Stoke Box, just over 100 miles from London. This is negligible as far as the 85 mile-post, immediately beyond Tallington, but continues at 1 in 440 and 264 to the 89 mile-post, beyond Essendine, and then, after two easy miles, for 4½ miles at 1 in 200 to the 95½ mile-post. An easy 1½ miles to Corby precedes the final ascent—3 miles at 1 in 178—to Stoke Summit. The remainder of the journey to York is of comparatively easy grading, in this direction of running. Five miles down at 1 in 200 bring us to the precincts of Grantham, and then, after 2¼ slightly undulating miles to the mouth of Peascliffe Tunnel, the descent is renewed—a mile at 1 in 440, 2 at 200, 2 at 300, 1¼ at 330, a slightly rising mile, and finally 1½ at 1 in



Photo] [*F. W. Curtis.*

GREAT NORTHERN RAILWAY.
King's Cross–York express. 4–4–2 locomotive No. 1412.

After Huntingdon we have the 3 miles' ascent of Stukeley bank—at 1 in 200—which can be almost taken "at a stride" if the speed through Huntingdon be sufficiently high, and a level mile at the summit is succeeded by 4½ miles down at the same inclination into the western confines of Fenland. Past Holme there are 4¼ miles of dead level, succeeded by a mile up at 1 in 150–264 to Yaxley, a level 3 miles beyond, and a sharp rise and fall over the Nene into Peterborough, where a very severe service slack is in force. The recovery from this delay takes place up a mile at 1 in 270, followed by a gentle descent to Werrington, where the first track-troughs out of London are situated, 79½ miles from the start. At the 80¾ mile-post there commences the worst

220–330 past Claypole. After 11½ miles faintly undulating or level, we come to Tuxford bank, 7½ miles long, of which only the 2¾ miles up to Tuxford are continuously at 1 in 200, the last 2¼ miles to Markham Box being broken by short strips of level. Askham bank is a descent of 3¼ miles at 1 in 200–178 to the 137½ mile-post, and is succeeded by 2 faintly rising miles past Retford, a mile down at 1 in 198 to Sutton, and a fractional descent for 6 miles thereafter to Scrooby troughs. Then comes the 3 miles' rise to Piper's Wood and the 2¾ miles' descent to Black Carr Junction, 2 miles of the former and 2¼ of the latter being at 1 in 198.

After that there are practically no further gradients worth mentioning, the line being

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2.20 P.M. KING'S CROSS–GRANTHAM.

Distance.	Run No. .. .. / Engine 4-4-2 No. .. / Driver .. .. / Load (Axles) .. / „ (Tons Tare) .. / „ (Tons Full) ..	Net Times.	1 / 280 / Hawbrook / 48 / 329 / 345	2 / †1406 / Short / 50 / 338 / 355	3 / †1404 / Wright / 52 / 341 / 360	4 / †1404 / Wright / 51 / 342 / 360	5 / †1405 / — / 50 / 347 / 365	6 / †1406 / Short / 52 / 348 / 365	7 / 282 / — / 54 / 365 / 385	8 / 282 / — / 54 / 368 / 390	9 / †1406 / Chatwin / 54 / 377 / 400	10 / †1404 / — / 58 / 395 / 415	11 / 287 / Robinson / 58 / 402 / 425	12 / 287 / Robinson / 58 / 395 / 415
Miles.		M.	M. S.	M. S.	M. S.	M. S.	M. S.	M. S.	M. S.	M. S.	M. S.	M. S.	M. S.	M. S.
0·0	King's Cross dep.	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2·5	Finsbury Park pass	—	6.55	8.15	6.50	6.40	7.55	k 11.10	9.05	9.35	9.00	8.15	8.15	8.10
12·7	Potter's Bar „	—	a 21.10	22.25	a 20.45	a 20.55	22.35	25.55	23.55	24.50	n 25.30	24.25	23.20	24.10
17·7	Hatfield .. „	23	26.25	27.45	25.40	25.40	27.50	31.15	29.20	30.20	31.00	30.15	28.45	29.50
25·0	Knebworth .. „	—	33.45	35.20	d 35.05	33.00	34.55	38.35	d 38.00	37.55	38.35	38.20	36.25	38.05
31·9	Hitchin .. „	38	b 42.45	b 43.50	b 45.00	b 43.00	41.20	b 47.00	44.45	44.35	44.50	45.05	43.00	45.10
37·0	Arlesey .. „	—	47.00	48.10	49.10	47.25	45.15	51.20	48.40	l 49.00	48.40	49.10	47.05	49.30
44·1	Sandy .. „	—	53.20	54.45	e 56.25	53.55	h 56.20	57.55	54.30	58.00	54.25	55.35	53.15	55.55
51·7	St. Neot's .. „	—	60.30	62.25	64.25	61.30	64.15	65.50	61.20	66.30	61.20	63.15	60.20	63.35
58·9	Huntingdon .. „	66	67.15	69.15	f 72.35	68.45	71.15	73.05	67.55	74.00	67.55	70.40	66.55	70.45
63·5	Abbots Ripton „	—	72.25	74.35	78.50	74.25	76.55	79.00	72.55	79.30	73.15	76.20	72.05	76.30
69·4	Holme .. „	—	77.25	79.40	83.50	79.45	82.15	84.20	m 78.15	84.50	78.25	81.40	77.20	81.50
76·4	Peterborough¶ „	85	84.25	86.25	90.30	86.50	89.40	91.55	85.30	92.45	85.45	89.30	84.25	89.05
81·9	Helpston .. „	—	c 94.15	94.05	98.20	94.45	98.15	100.00	94.05	101.00	94.00	98.00	91.55	96.50
88·6	Essendine .. „	—	103.55	101.10	105.00	101.25	105.00	107.00	101.05	109.00	100.50	104.50	99.15	104.50
97·1	Corby .. „	—	115.40	111.55	115.10	111.45	115.20	117.20	111.45	121.10	112.20	116.40	110.15	116.35
100·1	Stoke .. „	—	120.00	116.20	119.20	116.05	119.40	121.40	116.15	126.10	116.40	121.20	114.40	121.10
105·5	Grantham .. arr.	122	126.40	g 122.40	125.30	g 123.35	125.45	g 128.00	g 122.55	g 133.50	123.00	127.50	121.05	128.20
105·5	Net times (mins.) ..	122	118½	120	116½	118	119¾	122	120½	129¼	121	127¾	121	128¼

a—Wood Green Tunnel, p.w.r., slight. b—Langley, p.w.r., severe. c—Werrington, p.w.r., very severe. d—Digswell, sigs., severe. e—Stratford Brook, sigs. f—Wood Walton, p.w.r. g—Saltersford, sigs. h—Langford, sigs., dead stand. k—Belle Isle, sigs., dead stand. l—Arlesey, sigs., very severe. m—Ripton, p.w.r., slight. n—Finsbury Park, sigs., severe. ¶—Service slack. †—Superheater engine.

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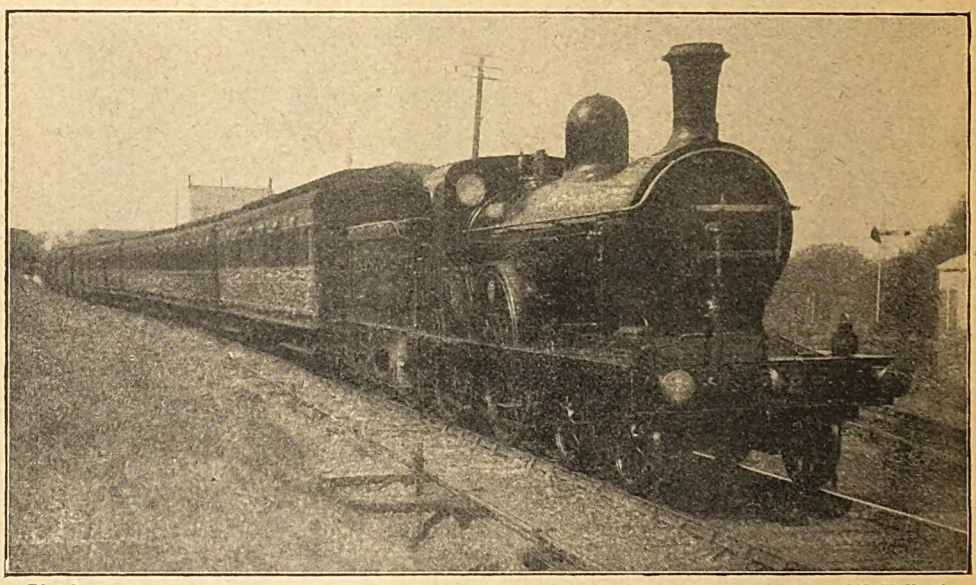
dead level, or having only infinitesimal undulations, save for the mile up at 1 in 264 before Doncaster, the slight ascents past Balne and Heck, beyond Selby, and to Escrick, the two last-named each including ¾-mile at 1 in 200. A service slack is imposed at Selby, in view of the swing-bridge and curve beyond, but this has recently been raised, I believe, to 40 m.p.h., and does not therefore constitute the same hindrance as formerly. There is also a nominal restriction to 40 at Doncaster, which is not always observed with the greatest of rigour. But the initial stretch from London to Grantham is much harder for the same average speed than the succeeding length to York, and the difference is apparent in the average times achieved on these two sections with similar loads. Indeed, the speed at which all the service restrictions are taken are subject to considerable variation. As regards the tabulated runs, this was particularly the case at Selby, which we passed at rates varying from 30 to all but 50 m.p.h., with the result that the times with heavy loads up the gradual succeeding ascent to Escrick were correspondingly influenced. Through Doncaster there was on some runs a pronounced "easing," but on others full speed was maintained. Certain drivers also eased the speed through Retford, which was on other occasions passed at from 65 to 70 m.p.h. The immediately succeeding times are fairly significant of the rate at which each of these points was passed.

Before mentioning the runs individually, a few remarks may be made as to the working times, which are in certain respects very curiously arranged. Presumably they have remained unchanged since before the days of corridor coaches and dining cars, when Scotch expresses were composed of six-wheelers and weighed something like one-third of what they do at the present time. Uphill work would therefore in all probability have been superior in character to what now obtains, while of course the downhill running —fortunately for the passengers, considering the track and rolling stock of the period— was not to be compared with the lightning speed of to-day. Thus it is quite likely that the allowance of 23 min. for the first 17·7 miles to Hatfield was at the time of its institution a fairly reasonable one, while 28 min. for the 26·9 miles from Hitchin to Huntingdon was also more or less representative of actual running. But at the present time it must be confessed that these times are in need of drastic revision. The average unchecked times out to Hatfield on the runs tabulated works out at 28¼ min., while the average from Hitchin to



Photo] [*N. Holland.*

GREAT NORTHERN RAILWAY, IRELAND.
12.40 p.m. Londonderry–Belfast express passing Omagh Market Junction.
4–4–0 locomotive No. 123.

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4 26 P.M. GRANTHAM-YORK.

Distance.	Run No.	Net Times.	1	2	3	4	5	6	7	8	9	10	11	12
	Engine No.		258	990	949	257	297	258	1402	58	56	58	58	41
	Type		*4-4-2	*4-4-2	*4-4-2	*4-4-2	4-4-2	*4-4-2	4-4-2	†4-4-0	†4-4-0	†4-4-0	†4-4-0	4-4-0
	Driver		Ledger	—	Hawbrook	Doolan	—	Hall	—	Brown	Brown	Brown	Brown	Sharp
	Load (Axles)		48	50	52	51	50	52	54	58	58	58	58	58
	„ (Tons Tare)		329	338	341	342	347	354	365	388	395	395	397	402
	„ (Tons Full)		345	355	360	360	365	375	385	410	415	415	420	425
Miles.		M.	M. S.	M. S.	M. S.	M. S.	M. S.	M. S.	M. S.	M. S.	M. S.	M. S.	M. S.	M. S.
0·0	Grantham .. dep.	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6·0	Hougham .. pass	—	9.25	9.40	9.45	8.55	9.25	9.15	9.10	9.30	10.00	9.50	9.55	9.40
14·6	Newark .. „	17	17.20	17.05	c 19.05	16.10	17.05	16.35	c 19.50	16.55	18.40	17.35	17.45	17.25
20·9	Carlton .. „	—	23.25	b 25.55	d 35.15	l 21.55	22.55	22.10	26.10	22.35	25.15	23.35	23.55	23.20
26·4	Tuxford .. „	—	30.05	33.45	42.50	30.30	29.20	28.20	32.20	28.45	32.40	30.15	30.45	30.10
33·1	Retford .. „	39	37.55	41.35	50.40	38.10	37.15	35.55	g 41.00	36.35	40.50	38.25	39.10	38.30
42·2	Bawtry .. „	—	a 47.25	50.20	60.05	46.40	46.05	h 46.10	50.15	45.30	49.45	47.50	48.00	47.45
50·5	Doncaster .. „	58	57.20	59.10	69.30	c 56.00	55.15	55.30	58.55	55.00	k 59.10	57.10	57.10	57.15
54·7	Shaftholme Jc. „	63	62.05	64.20	74.05	62.20	59.55	59.55	63.20	sigs.	64.20	62.00	62.15	62.15
60·5	Balne .. .. „	—	68.15	70.45	80.10	68.30	66.05	65.55	69.20	sigs.	70.30	68.05	68.55	68.50
68·9	Selby¶ .. „	79	77.15	80.30	89.10	77.40	75.30	74.35	78.35	sigs.	79.40	77.55	79.00	78.35
75·6	Escrick .. „	—	86.05	89.55	97.45	86.55	84.20	83.15	88.05	sigs.	88.00	87.15	87.40	87.25
82·7	York .. .. arr.	97	94.25	‡98.10	106.25	f 97.00	‡92.40	91.55	97.00	sigs.	97.00	96.20	96.30	96.50
82·7	Net times (mins.) ..	97	93	‖95	94	90½	‖93½	90	93	94	96½	96¼	96½	96¾

*—Small-boilered type. †—Superheater engine. ¶—Service slack. ‡—Signal stop, Holbeck Bridge, York. a—p.w.r., Bawtry, severe. b—p.w.r., Muskham, severe. c—p.w.r., Claypole, severe. d—Sigs., Trent, dead stand. e—Doncaster subway, sigs. and p.w.r., very severe slack. f—p.w.r., Chaloner Whin. g—p.w.r., Markham. h—Storm delay, Retford to Doncaster. k—Sigs., Balby (Doncaster), very slight. l—p.w.r., Carlton, very severe. ‖—Calculated to York station.

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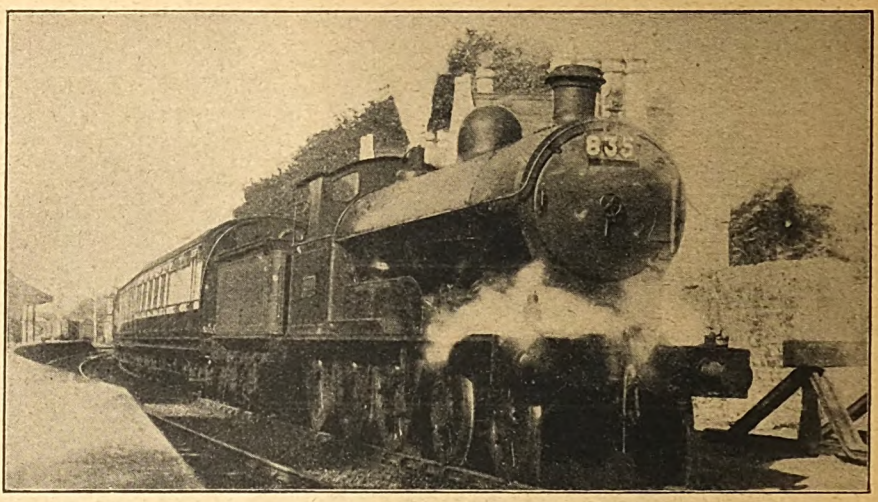

Photo] [*J. Macartney-Robbins.*

LONDON AND NORTH WESTERN RAILWAY.

Holyhead–Chester train at Menai Bridge Station.
4–6–0 superheater engine No. 2249 *Thomas Campbell.*

Huntingdon is 24¾ min., the average error from the working times between Hatfield and Hitchin working out therefore at fully 5 min. The allowances from Hatfield to Hitchin and from Huntingdon to Peterborough are also on the easy side to the extent of about a minute apiece, so that it is a matter of little difficulty to convert arrears of 5 or 6 min. at Hatfield into a punctual passage of Peterborough. An allowance of 37 min. from Peterborough to Grantham is not excessive with heavy loads, and is seldom improved on. Altogether the driver of a Great Northern "Atlantic," with a load of 400 tons, has his work cut out to keep time, particularly in view of the absence of any facilities for taking water in the first 80 miles from town. When the Great Northern relaying "season" is on, or signal delays are unduly in evidence, even 122 min. becomes a "counsel of perfection" for the 105½ miles to Grantham under these conditions. The northern section of the run is, by comparison, easily timed, such a time as 22 min. from Newark to Retford being quite unduly liberal. Thus the losses to Grantham are often balanced by the gains from there to York.

The runs described are selected from a total of eighteen, the remainder of which, being of the character of runs 8, 10 and 12 in the first table, are hardly worthy of mention. I have only included these three journeys as showing what a tremendous effect a side-wind has on the running times, the comparison between runs 7 and 8, and runs 11 and 12, with the same engines and practically identical loads, being quite extraordinary. As will be seen, the runs are graded according to load, the lightest on any of the journeys being that of run 1, when a total of only 48 axles was taken. But with this Hawbrook, on No. 280—a non-superheater engine—performed some excellent work. A very slight check was made through Wood Green Tunnel, and speed fell to 37·5 m.p.h. at Potters Bar, but recovered to 71·4 at Hatfield. The Langley bridge check, however, was very severe, and as a result we did not exceed 73·8 m.p.h. at Arlesey, the loss of impetus at Stevenage invariably, as I found, affecting the maximum rate beyond. But good sustained work followed, especially beyond Huntingdon, the minimum of 50 m.p.h. on Stukeley bank, and the maximum of 75 on Ripton bank being both good figures, while it is very unusual to maintain a rate of 61·6 m.p.h. to Fletton Junction, and to increase it again to 64·3 before Peterborough, as we did on this occasion. Thus the Cathedral City was passed well on time, and in about 80½ min. net from town. At Werrington, however, we suffered an exceedingly severe and prolonged permanent way check, and all chances of time-keeping were thereby disposed of, as our speed never recovered to more than 45 m.p.h., and fell to 38·5 at Stoke Summit.

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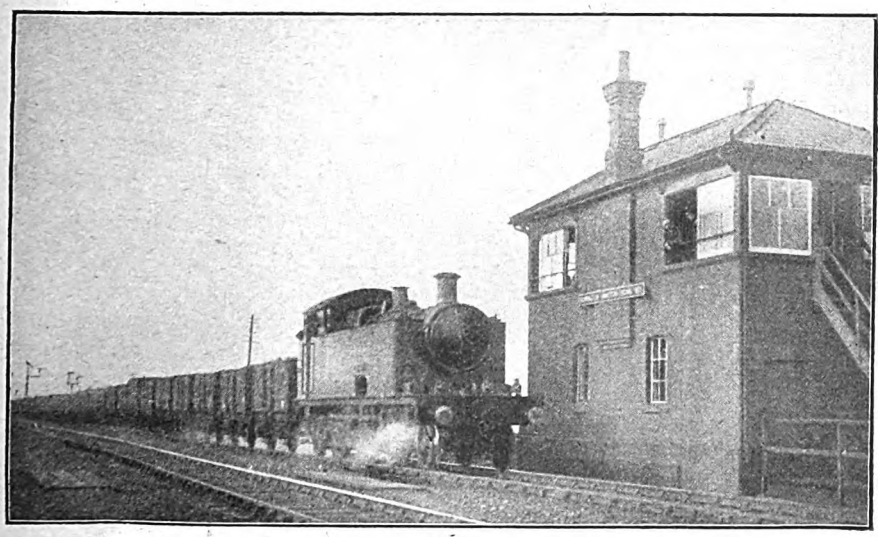
Runs Nos. 2 and 6, behind the same engine, were neither of them particularly enterprising journeys, save in their concluding stages. On run 2 we fell to 40·9 m.p.h. at Potters Bar, and only touched 69·2 at Hatfield, so that the Langley check, fairly severe as usual, left us nearly 6 min. in arrears at Hitchin. After this we did not exceed 72·5 m.p.h. at Arlesey, and fell to 55 on the modest rise to St. Neots, although managing to attain a maximum of 68·1 m.p.h. at Offord. Matters now improved, however, as the lowest rate up Stukeley bank was 48·4 m.p.h., and we touched 73·8 on the succeeding Ripton descent, while with a faster passage of Peterborough station than usual we tied with the times of the preceding run from Huntingdon. Beyond Peterborough also good running was made, speed rising to 60 m.p.h. at Tallington, and not falling below 37·5 at Stoke Summit. On run No. 6 we met with a disheartening delay right at the start in the shape of a dead stand for signals at Belle Isle Box, between Maiden Lane and Copenhagen Tunnels, to which the Langley check was added later; whether this meant an undue depletion of the water supply I cannot say, but the subsequent running, especially from Hitchin to Peterborough, was decidedly feeble. Speed fell to 39·1 m.p.h. at Potters Bar, rose to 71·4 at Hatfield, and fell again to 52·9 at Woolmer Green. Beyond Hitchin we only touched 72·5 m.p.h. at Arlesey, and actually passed St. Neots at a beggarly 51 m.p.h., but there was some improvement beyond Peterborough, a minute being gained to Grantham, despite two slight signal checks prior to the stop. The lowest rate at Stoke was exactly 40 m.p.h. Run No. 5 partook of the nature of the "curate's egg." We started in leisurely fashion, falling to 40 m.p.h. at Potters Bar, although we attained 72·5 at Hatfield, and touched 80·3 beyond Hitchin. Then followed a very serious delay, the train being stopped dead at Langford Box for fully a minute, on account of the 1.45 p.m. down "parly" from King's Cross shunting ahead of us at Biggleswade. From this check we recovered very slowly, and even though we attained a speed of 64·3 m.p.h. at Offord, the rate fell to 42·9 on Stukeley bank, and only rose to 72·5 before Holme. Beyond Peterborough, however, we did better, reaching the mile-a-minute rate at Tallington, but at Stoke Summit the speed dwindled down to 40·9 m.p.h., and thus we reached Grantham nearly 5 min. late.

The finest runs of the whole series, however, were probably Nos. 3 and 4, the work of driver Wright on the superheater "Atlantic" No. 1404 being quite superlative in character. I described these runs in the RAILWAY MAGAZINE exactly one year ago, and brief mention of their leading features



Photo] [*W. L. Kenning.*

GREAT WESTERN RAILWAY.

Banbury–Basingstoke goods train passing Kennington Junction. 2–6–2 tank No. 3920 (converted from 0–6–0 goods engine).

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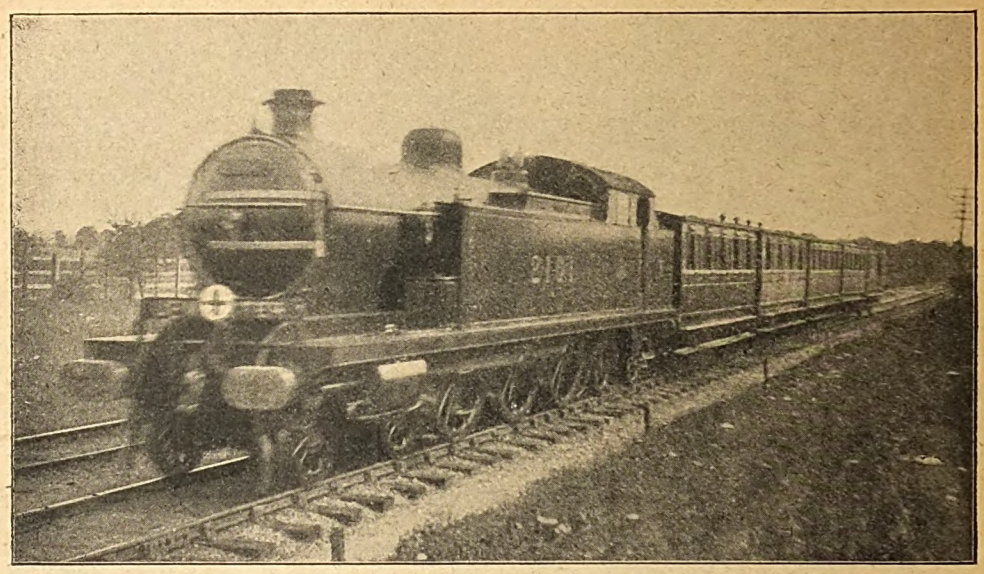

Photo] [*K. G. C. R. Nunn.*

MIDLAND RAILWAY (L. T. & S. SECTION).

9.15 a.m. Southend–Upminster train nearing Upminster Junction.
4–6–4 superheater tank engine No. 2101.

will therefore suffice. On run three the slack through Wood Green Tunnel was quite pronounced, but afterwards we maintained a steady 45 m.p.h. up the 1 in 200, and passed Hatfield at 73·8 m.p.h. After that delays came thick and fast, including signals at Digswell, the chronic Langley check, signals again at Langford on account of the offending "parly," and a further permanent way caution at Offord. Between these checks came a maximum of 73·8 m.p.h. at Arlesey, while we touched 75 in the descent of Ripton bank, and well maintained our speed beyond, as we were still doing 66 when steam was shut off for Peterborough. Beyond Peterborough also we did excellently, touching 63·8 m.p.h. at Tallington, and not having fallen below 57 at Essendine, 52·3 at Bytham, and 45 at Corby. The lowest rate at the summit was 37·5 m.p.h., and the times of 28 min. 50 sec. on this run, and 29¼ on the next, were substantially the best of the series from Peterborough to Stoke. It was remarkable that after all this sequence of delays we were only 3½ min. late on arrival. Run No. 4 was very similar in character, but included fewer checks. Again we suffered a noticeable check beyond Wood Green, and again the sustained rate on the 1 in 200 beyond was 45 m.p.h. After that a tremendous burst of speed past Hatfield ensued, all my records here being broken by a maximum of 76·3 m.p.h.—both these runs, indeed, were easily the fastest of the series between Potters Bar and Hatfield. After Langley check we continued rather moderately to Huntingdon, but touched 75 m.p.h. down Ripton bank, and so passed Peterborough less than 2 min. late. A further characteristic ascent followed to Stoke, with a maximum of 64·3 m.p.h. at Tallington, and a minimum of 37·5 at the summit, and had it not been for a signal check outside Grantham we should have arrived practically on time.

We now pass on to some runs with substantially heavier trains. No. 7 was a most interesting journey. A very slow start was made, and at Potters Bar we were only doing 37·5 m.p.h., while the value of a maximum of 71·4 m.p.h. at Hatfield was spoiled by a signal check at Digswell. But beyond Knebworth some remarkable work was performed. The maximum speed beyond Hitchin was a sustained 79 m.p.h., while for many miles further the rate continued very high. At Biggleswade we were doing 75 m.p.h., at Sandy 70·3, and Tempsford 68·1, and a minimum of 60·8 at St. Neot's was succeeded by a maximum of 69·2 at Offord. The ascent of Stukeley bank was very good, no lower speed than 51·7 m.p.h. being touched, and although a slight check was experienced beyond Ripton, we attained 71·4 m.p.h. on the descent to Holme. Thus

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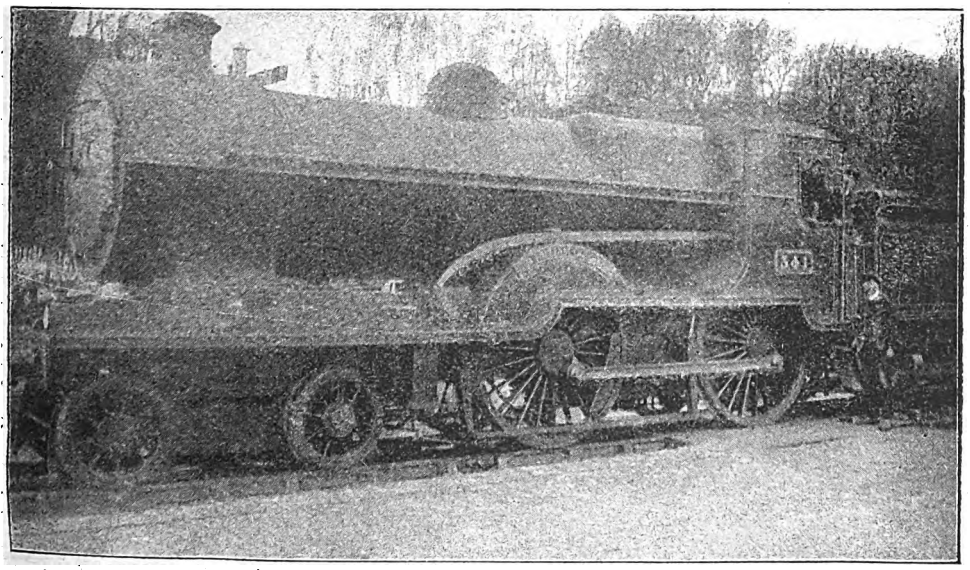
Peterborough was passed in the excellent net time of 83½ min. from London. Time was also kept on the concluding stage of the journey, as the mile-a-minute rate was reached at Tallington, and we sustained 37·5 m.p.h. up the final rise to Stoke, save for a brief fall to 36·6 through premature notching up. If it had not been for a slight signal check outside Grantham, we should have been in on time, but in any case such an effort with this heavy load was quite praiseworthy, especially as the engine concerned is not superheater-equipped. By contrast with this run the times of No. 8, with the same engine, driver and load seem exceedingly poor, although it must be admitted that a violent westerly wind caught the train badly on exposed sections of the line. We did not touch any higher speed than 69·2 m.p.h. at Hatfield and 75 beyond Hitchin, while the bad check at Arlesley appeared completely to dishearten the driver, and we lost time steadily from that point until the conclusion of the run.

There is a similar resemblance between runs 9 and 10, although in these cases the differences in running are not quite so marked; Chatwin's work with No. 1406 was, however, altogether superior to that recorded with No. 1404. On the former day the weather was very bad, the journey starting in torrents of rain, which later changed to snow. For this reason we slipped badly at the start, and further loss of time was occasioned by the fact that we took the slow road to Finsbury Park—for what reason I was unable to ascertain—and slacked severely to take the fast line beyond the latter station. These delays helped to make us 8 min. late past Hatfield, but thenceforward matters greatly improved. We touched 69·2 m.p.h. beyond Hatfield, fell to 49·5 at Woolmer Green, and then sustained a rate of 81·8 for some distance beyond Hitchin. This fell to 75 m.p.h. at Biggleswade and 70·3 at Sandy, and a minimum of 60 at St. Neot's was succeeded by a maximum of 68·1 at Offord. Thus our times on this run were the best of the series from Knebworth to Sandy—a distance of 19·1 miles which was covered at an average of 72·4 m.p.h.—whereas from Sandy onwards they were inferior to those of Run 7. Up Stukeley bank we fell to 47·9 m.p.h., while our highest speed in descending to Holme was 73·8; on shutting off steam before Peterborough the rate had fallen to 57·7 m.p.h. Beyond Peterborough we did moderately, only just keeping to the 37 min. allowed thence to Grantham; we did not accelerate beyond 56·3 m.p.h. at Tallington, and fell to about 37 at the summit. Load considered, however, this was a very fair run. By contrast, No. 10 journey showed poor work



Photo] [T. Grove White.

GREAT SOUTHERN AND WESTERN RAILWAY.

4-4-0 locomotive No. 341, *Sir William Goulding.*

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especially in view of what Wright had demonstrated on runs 3 and 4 as to the capabilities of this particular engine, although, of course, the load was substantially heavier. Without any delays whatever, schedule time from London to Grantham was exceeded by nearly 6 min. Many of the minimum speeds were very low, such as 32·4 m.p.h. at Potters Bar, 46·9 at Woolmer Green, and 52·9 at St. Neot's, while the top speeds reached at Hatfield, Arlesey and Holme respectively were only 66·1, 75 and 69·2 m.p.h. respectively. Further time was lost north of Peterborough, the rate at Stoke summit falling to 36 m.p.h.

Another striking contrast is furnished, finally, in runs 11 and 12, again with the same engine and driver, and practically the same load. It need hardly be emphasised that 415 and 425 tons are very heavy loads for a road such as the Great Northern, and on this account Robinson's work on a non-superheater engine, in column 11, is the more praiseworthy, as, on an unchecked run, a minute was gained on schedule time. A good start was made, the lowest speed at Potters Bar being 39·1 m.p.h., and a maximum of 70·3 at Hatfield was succeeded by a minimum of exactly 50 at Woolmer Green. The sustained rate beyond Hitchin was 77·5 m.p.h., and the lowest speed up Stukeley bank again exactly 50—excellent going this! —while a top speed of 72·5 m.p.h. was attained on Ripton bank. On shutting off steam beyond Fletton Junction we were doing exactly a mile-a-minute, and Peterborough was passed with ½-min. in hand. First-class work was involved in covering the 58·7 miles from Hatfield to Peterborough with this load in 55 min. 40 sec.—an economy of 6 min. 20 sec. on the exaggerated schedule allowance. The only actual time that was better than this was that of Run 9, when Chatwin ran between these two points in 54¾ min. A further slight gain on time was made between Peterborough and Grantham, the lowest rate of ascent being 37·5 m.p.h., and we thus arrived a minute early. Robinson's second attempt, in column 12, was made under the hampering effect of a brisk north-east wind, the effect of which is clearly apparent in the increased times. Thus the lowest speed at Potters Bar was 36·6 m.p.h., and at Woolmer Green 45·5, while at Hatfield and Arlesey we did not exceed 64·3 and 72·5 respectively. Although we gained 2¾ min. between Hatfield and Peterborough, the initial loss was added to by a further 2¼ min. north of Peterborough, and we arrived 6¼ min. late.

A careful examination of this table reveals the fact that, with an average load such as those indicated, the times are only capable of observance, under average circumstances, when there are no delays *en route*. I have averaged the unchecked point-to-point times, which work out at 22 min. 56 sec. to Potters Bar, 28 min. 17 sec. to Hatfield, 42 min. 31 sec. to Hitchin, 52 min. 50 sec. to Sandy, 67 min. 13 sec. to Huntingdon, 85 min. 11 sec. to Peterborough, 100 min. 22 sec. to Essendine, 115 min. 52 sec. to Stoke, and 122 min. 12 sec. to Grantham. Under such load conditions it is therefore evident that there is no margin of time whatever on the booking, and it must also be remembered that I have refrained from including in the table several further runs of the same character as Nos. 8, 10 and 12, which would still further increase these averages. My latest run on this train, indeed, with a large "Atlantic" and a load equal to that of run 12, resulted in a loss of all but 38 min. to Grantham, against which could be set only one permanent way delay, costing about 4 min. I have not yet had the opportunity of timing any running behind the converted 4-cylinder "Atlantic"—No. 279—and so am unable to say here whether enhanced cylinder power has proved of substantial value in dealing with heavy loads. But I must confess my entire agreement with the sentiments of a strong Great Northern supporter who in a recent letter to me expressed a desire to see how one of the superheater "Atlantics" of the London, Brighton and South Coast Company—almost identical with the Great Northern superheater "Atlantics" save for 21 in. by 26 in. cylinders instead of 20 in. by 24 in.—would "shape" on the Great Northern main line. Although the maximum load allowed to the Great Northern engines is now one of 60 axles, time-keeping is generally more or less uncertain after the 50 limit has been passed, and in these days of greatly increasing loads it will be necessary ere long either to decelerate the trains or to increase the locomotive power. One is tempted to wonder how the latter increase will be made—whether by a development of the 279 principle, or by an enlarged version of the existing "Atlantics," with larger boilers, cylinders, and more adhesion weight, or by an entirely new design. It is not to be supposed that the Great Northern locomotive authorities would favour the 4-6-0

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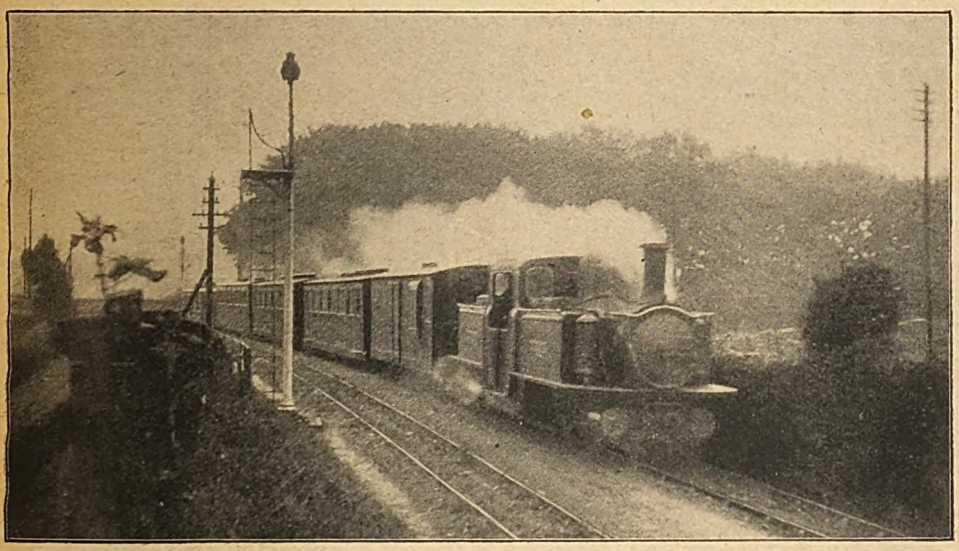
wheel arrangement, and the most logical development of the "Atlantic" would therefore be the "Pacific," or 4–6–2 arrangement, which would enable such a characteristic feature as the Great Northern fire-box to be retained. The speculation is one of considerable interest

I have not left much space in which to deal with the second collection of runs, northward on the same train from Grantham. Its principal feature is the prominence given to the work of the small "Atlantics," and also to the superheater 4–4–0 engines, which, curiously enough, were entrusted with all the heaviest loads. The biggest train of all, *mirabile dictu*, was convoyed by the small Ivatt 4–4–0, No. 41! A number of these runs have been referred to previously, and a brief reference to them will therefore suffice on the present occasion. I may say that I have averaged out the unchecked times on this section also, and that they work out at 17 min. 15 sec. to Newark, 37 min. 43 sec. to Retford, 56 min. 9 sec. to Doncaster (2 min. under booked time from Retford to Doncaster), 76 min. 33 sec. to Selby, and 94 min. 46 sec. to York. That is to say, there is an average margin of just over 2 min., under all conditions, in the booked allowance of 97 min. from Grantham to York.

As regards the runs, No. 1 was a good journey with a moderate load, on which time was gained steadily all the way from Newark, save only between Retford and Doncaster, where a permanent way check occasioned a slight loss. The best feature of the journey was perhaps the time of 37 min. 5 sec. from Doncaster to York, although we went through Selby rather faster than usual. On No. 2 run we started more rapidly, attaining 69·2 m.p.h. beyond Claypole, but were badly slowed for relaying beyond Newark, and after that did rather feebly on to York, where we were stopped by signal at Holbeck Bridge. The next run—No. 3—was one on which these features were exactly reversed, as a relaying slack at Claypole was succeeded by a dead stop at Trent Box on account of part of an up goods train having broken loose. It was not, of course, possible to regain all this delay, but no attempt at fast running was made until after Doncaster, from whence to York the fastest run but one of the series was made, and 2 min. were gained. No. 4 was an exceedingly fine journey, Doolan contriving to keep his booked time despite three serious checks. The first of these occurred at Carlton station, after a magnificent start, in which a sustained rate of 72·5 m.p.h. was reached at Claypole, and the initial $19\frac{3}{4}$ miles to the $125\frac{1}{4}$ mile-post had been covered in 20 min. 35 sec. This spoiled the ascent of Tuxford bank, but we



Photo] [*K. A. C. R. Nunn.*

FESTINIOG RAILWAY.
9.30 a.m. Duffws–Portmadoc train leaving Minnfordd Junction.
0–4–4–0 "Fairlie" locomotive No. 8 *James Spooner.*

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touched 68·1 m.p.h. in descending to Retford, and were still doing 66·1 when we reached Scrooby troughs. The lowest rate at Piper's Wood was 49·5 m.p.h., while shortly afterwards we were pulled up badly by signal for the subway works at Doncaster station. Our net time to this point was but little over 53 min. Good work was done from Shaftholme to Selby, but an unusually severe slack there, and a further permanent way caution at Chaloner Whin Junction prevented us from gaining anything on the end-to-end time. The net time of 90½ min., however, showed a praiseworthy economy of 6½ min. on schedule.

One of the only two journeys behind large "Atlantics" is shown in column 5. It has no features of special note, but time was being gradually gained all the way from Newark. The minimum speed of a fraction under 40 m.p.h. at Markham summit was rather poor, but we touched 67·1 in descending to Retford, and the time of exactly 18 min. thence to Doncaster was a good one. This run also concluded with a premature stop at Holbeck Bridge, York. The other journey with the same type of engine is that shown in column 7, and the two bear a strong resemblance to each other. Permanent way relaying cautions—at Claypole and Markham—delayed the latter run in its earlier stages, but ample amends were made beyond Retford, the time of 37 min. 35 sec. for the 35·8 miles thence to Selby being a particularly good one, and, moreover, 2½ min. under schedule. Selby and the approach to York, however, were taken very cautiously, and in consequence the gross time showed no curtailment of booked time. The finest "Atlantic" run was undoubtedly No. 6, and driver Hall deserves hearty commendation for some thoroughly enterprising work. As far as Hougham the start was not exceptional, but beyond Claypole we touched 73·8 m.p.h., and so beat all competing times from Carlton on to Retford, although the times of run 4 would, of course, have been still better but for the Carlton relaying delay. At Crow Park we were still doing 64·3 m.p.h., and the lowest speed on Tuxford bank was 42·9 m.p.h. Immediately after this, however, we ran into a remarkable atmospheric disturbance, which lasted almost to Doncaster, and so impaired the visibility of signals that we had to run very cautiously for this distance. After Doncaster, the fast running was resumed, and by a sustained mile-a-minute rate on to Selby, and further excellent work beyond, over 2½ min. were gained between Doncaster and York, in addition to the 3 min. already gained from Grantham to Retford. Allowing 2 min. for the storm delay—a moderate estimate, on the basis of the times cited—our net time from Grantham to York was the very fine one of 90 min., or 7 min. under the time allowed.

We have finally to deal with the five 4–4–0 runs, which are of uncommon interest, as the loads in every case were enormous, and the dimensions of these engines are, after all, quite modest in comparison with those of some of the giants of this wheel arrangement in use elsewhere. The finest of these journeys was undoubtedly No. 8, and it was in the highest degree unfortunate that such first-class running was rendered valueless by reason of the string of checks north of Doncaster. Beyond Hougham we touched 72.5 m.p.h., and were still doing 66·1 at Carlton; the lowest speed at Markham was 41·3 m.p.h. So the excellent time was achieved of 36 min. 35 sec. to Retford, and by dint of good work along the level to Bawtry, and a minimum of 42·2 m.p.h. at Piper's Wood, we were through Doncaster in 55 min.—3 min. early. Here the checks commenced, but, even if we assume no further gain to York, the net time works out at 94 min., which is the allowance given to the much lighter 5.30 p.m. from King's Cross. By contrast No. 9 appears a singularly poor journey, at least in its early stages, although it may be mentioned that this run is the continuation of No. 12 in the previous table, and the north-east wind still exerted a hampering influence on the running. Consequently at Retford we had lost nearly 2 min. on the booking, but there matters greatly improved, and despite a slight signal check outside Doncaster, we pulled up steadily on schedule, and thus completed the journey exactly in the time allowed. Nos. 10 and 11 were journeys of no particular distinction, showing good steady work throughout, and close adherence to schedule times. The close correspondence of the times as far as Shaftholme Junction is worthy of comment, but on the second run the work was slower from Shaftholme to Selby and faster thence to York. Driver Brown deserves great credit for the consistent time-keeping shown on these runs, especially considering the character of engine and load.

The last run—No. 12—was quite a revelation to me in the matter of possibilities, as I had not the least expectation of time

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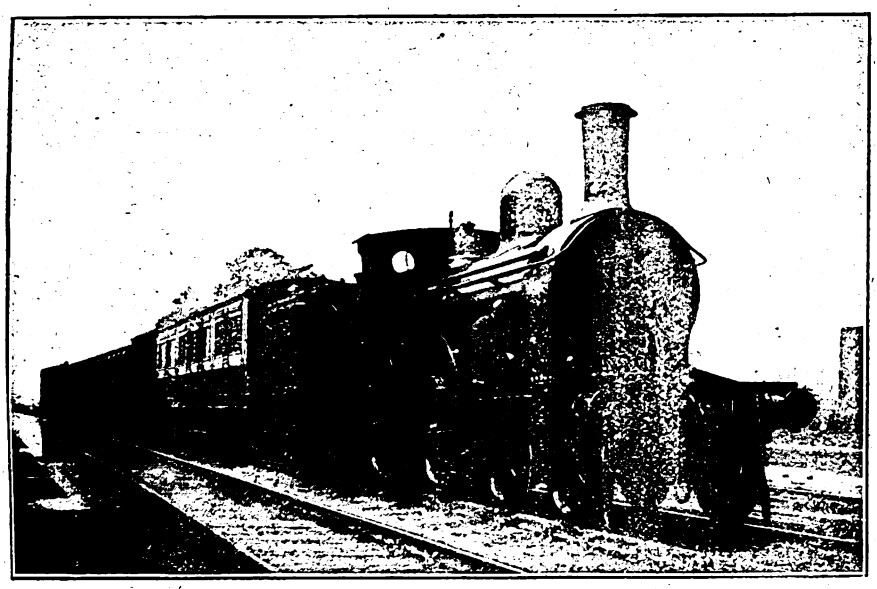

Photo] [*H. L. Hopwood.*

10.55 A.M. TRAIN *ex*-ABERYSTWYTH AT CEMMES ROAD STATION.

being kept under such truly abnormal conditions. But time *was* kept throughout the journey, owing to the excellent management of driver Sharp. Beyond Hougham we sustained 69·2 m.p.h., and maintained the mile-a-minute rate as far as Carlton. At Markham the lowest speed was 36·9 m.p.h., but descending to Retford we touched 64·3, and again kept up a steady gait of about 60 as far as Scrooby troughs, afterwards dropping at Piper's Wood to 42·1 m.p.h. Thus we passed Doncaster with ¾-min. in hand. Along the level on to Selby driver Sharp just held his own, and by dint of passing Selby a little faster than usual, he managed to run into York in 10 sec. under the 97 min. allowed—a highly creditable piece of work. Indeed, allowing for the increased loads, it is hardly possible to distinguish between the work of the 4–4–0 engines and the "Atlantics," despite the vastly superior steaming powers of the latter, but it would be exceedingly interesting to know what were the amounts of coal consumed respectively by the four types represented on these runs. I need only add that the whole of the engines and drivers concerned hail from Grantham in order to emphasise further the reputation enjoyed by that shed in the matter of painstaking locomotive performance.

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Locomotive and Train Working in the latter part of the 19th Century.

THE GREAT WESTERN RAILWAY (Standard Gauge). [No. IV.]

By E. L. AHRONS, M.I.Mech.E., M.I.Loco.E.

(*Continued from page* 351, *May* RAILWAY MAGAZINE.)

IN reference to the term "flies" applied to the Great Western slow "pick-up" goods trains, a correspondent suggests that the nickname was due to a contemptuous analogy with the old canal boats, which were frequently advertised as the (name of destination) "Fly." I had no knowledge of this, but it is quite possible that my correspondent is correct. There were quite a number of the Great Western "flies," *e.g.*, the "Bristol fly," the "Gloucester fly," etc. It is likely that the term may have been used on other railways in the South of England, although I never heard it except on the Great Western. On most of the northern lines such a train was generally referred to as the "Pick-up."

My correspondent also refers to certain other Great Western goods trains to which special nicknames were applied. These, however, were of a later date, and probably did not exist until close upon the end of the century. There was a stopping goods train between Oxford and Bristol which took the roundabout route *viâ* Newbury and Devizes, and was known as the "Gold Coast." It seems to have obtained this name owing to its taking the Didcot and Newbury route, known locally as the "Desert" or Suakim and Berber line. How the local Didcot railwaymen connected the "Gold Coast" with Suakim and Berber is not stated. However, both localities are in Africa, and I must leave it at that.

Another goods train, the up express market goods train to London, which left Penzance at 3.20 p.m., and was put on about 1894, blossomed out as the "Searchlight," from the nature of its headlights (Special B), which then consisted of three white lights in the form of a triangle, two over the buffers and one under the chimney.

I believe the fastest standard gauge goods train until the early 'nineties was the 9.50 p.m. from Paddington to Manchester. This train ran with a limited load of 27 wagons from London to Reading, and 31 wagons beyond Reading. It averaged a speed of 29·6 miles per hour to Reading, 29·7 miles per hour from Reading to Oxford, and 28·3 miles per hour from Oxford to Leamington, after which the speed dropped to 25 to 25½ miles per hour. But this train, though famous on the Great Western, was a long way behind the broad gauge "Tip," and also the Manchester fast goods trains of the Midland and Great Northern, which put in speeds of 33 to 35 miles per hour over the greater portion of their journeys.

I have described the Bristol and Exeter section so fully when dealing with the broad gauge lines of the Great Western Railway that there remains hardly anything to be added. Moreover, I have also mentioned that the standard gauge slow train service was almost entirely handled by the older 7 ft. singles of the "Sir Daniel" class, of which some 15 were stationed at Bristol. There was one goods train over the Bristol and Exeter that had to be worked very smartly by the engine. This was the 8.20 p.m. Swindon to Barnstaple, and I mention it to give an illustration of how a slight unpunctuality on the part of even a branch goods train may upset a main line passenger service for the whole of a day. This train, with a limited load of 40 wagons and a van, had to run very hard from Bristol to Taunton with only one stop at Bridgwater, not only to keep a clear road for the broad gauge

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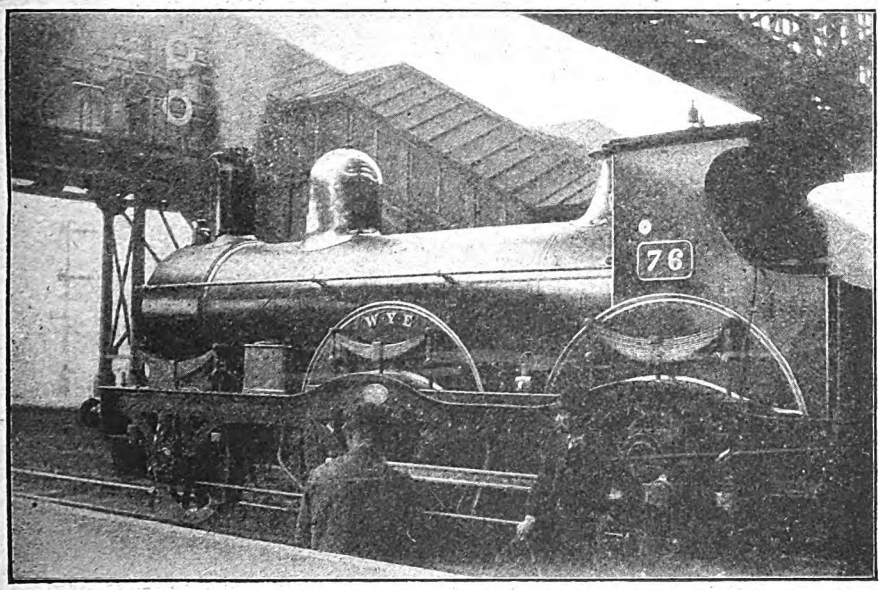
"Tip" which was following, but chiefly in order to be able to leave Taunton for Barnstaple in time to meet the early morning up passenger train at South Molton. This station was a crossing point on the single line, and any late arrival of the goods train meant a delay to the passenger train, which had an important London connection to make at Taunton. It could easily happen that a delay to this goods train on the borders of Exmoor could start a wave of unpunctuality which would be felt right up to Paddington. This train was worked by one of the standard double-framed goods from Swindon, but many of the standard gauge goods trains over the Bristol and Exeter Railway were worked by Nos. 1366 to 1375, 0-6-0 engines with single frames that had been constructed for the Bristol and Exeter Railway in 1875 by Messrs. Sharp, Stewart & Co.

At this stage I may draw attention to the complete change that has taken place during the last twelve years in the Great Western main lines, a change which is without parallel in the modern history of any great railway. The main line to the West of England no longer passes through Swindon, Bath and Bristol, but leaves the old line at Reading and joins it again at Cogload Junction, near Durston. This cut out 121¼ miles of the old line, and replaced it by a shorter length of 100¾ miles through Newbury, Westbury and Frome. The old "Great Way Round" is now only a loop, albeit a very important one. In the same way, the old route to South Wales, which parted from the main line at Swindon and passed through Gloucester, has been replaced by the new direct line through Badminton and the Severn Tunnel, a saving of 25¼ miles over the old route.

The third main line from London to Birmingham *viâ* Oxford, 129¼ miles, has been cut out to Aynho from a point only 3½ miles from Paddington by the new direct line *viâ* Bicester. Seventy-seven miles of the old line has been "eliminated" and replaced by a new express route nearly 19 miles shorter.



Photo] [*W. F. W. Shields.*

THE LAST ENGINE OF THE "RIVER" CLASS, AT SHREWSBURY.
Rebuilt as coupled engines, 1895-6. A view of No. 71 as a "single" appeared last month.

Finally, there is the new cross-country line which connects Birmingham with Cheltenham and enables the Great Western Railway to run competitive services between Birmingham and Bristol, but in this instance a portion of the run has to be made over the metals of its Midland competitor.

Returning now to Swindon, the South Wales train services, nearly all of which used to change engines at this point, may be considered. The only exceptions in regard to the change of engines at Swindon were the Milford boat trains, both up and down, which until 1887 were worked by Gloucester engines, but from that year they also fell into line, as already mentioned, and

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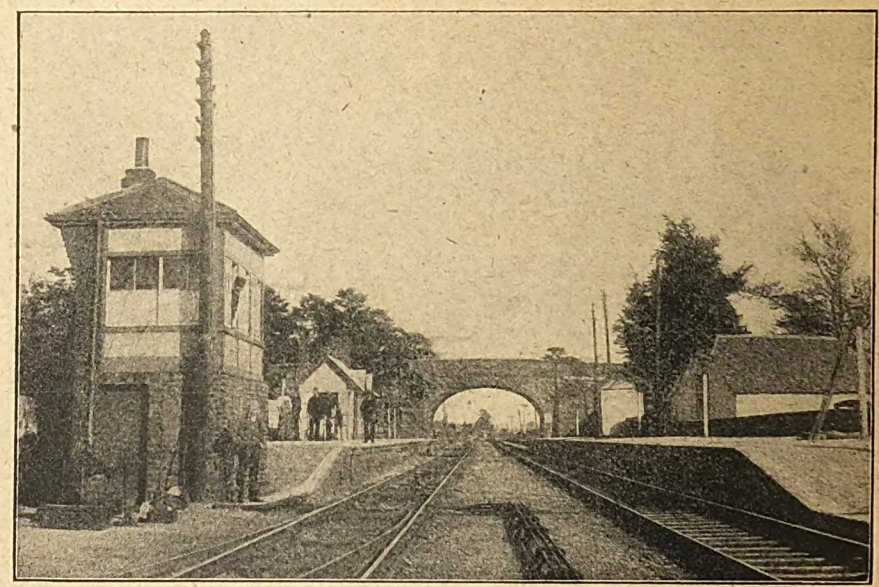
were worked between Swindon and London by Swindon engines.

Until a considerable time after the Severn Tunnel route was opened there were no real express trains on the South Wales services. The best was the above-mentioned boat train, the 5.45 p.m. from Paddington, which reached Cardiff in 4 hrs. 21 min., a journey speed of 39½ m.p.h. and a running average of 43½ m.p.h. Even Gloucester had to put up with the same speed, and this only with the same down train. This train made the longest non-stop run on the South Wales section, viz.: 44½ miles, Gloucester to Newport. The other express and mail trains had stops at Chepstow (some at Lydney also), in addition to the important towns of Newport and Cardiff. Beyond Cardiff, stops were made at Llantrissant, Bridgend, Port Talbot and Neath, so that by the time the Swansea passenger arrived at his destination he had had enough of "fast" trains to last him for a considerable period. Moreover, there were then no corridor trains or dining cars, so that the staple fare on a long tedious journey consisted largely of a special variety of Bath bun, then greatly in vogue on the Great Western Railway, the composition of which met the specification, "close-grained chilled material, with an ultimate tensile strength of about 10 tons per square inch." The best train took six hours to get to Swansea, and eight hours from London to Milford. Between Swindon and Gloucester all trains stopped at Kemble Junction and at Stroud.

An express service of this sort naturally had one effect on the train-timing enthusiast. I never kept any records myself of any of my many journeys over the South Wales section, nor did I ever hear of anyone else who did so. Consequently, I am unable to give any particulars of actual speeds.

Until early in 1887 the engines working from the Swindon end as far as Neath (131 miles) were the celebrated 6 ft. 6 in. singles, with 17 in. by 24 in. cylinders and 140 lbs. pressure, Nos. 69 to 76. (One of these was illustrated last month.) They worked three turns daily to Neath and back in addition to the two London trips already mentioned. These engines had large boilers, with 1,304 sq. ft. of heating surface, and weighed 31¾ tons, of which 14 tons rested on the driving wheels. They were popularly and also officially supposed to have been built in 1855–6 by Beyer, Peacock & Co., the first engines constructed by this well-known firm, but in actual fact the Beyer-Peacock engines had entirely disappeared, and the 69 class were in reality products of Wolverhampton works dating from 1872 to 1875. But I can truly state as a result of many miles of actual experience on them that they were *for their size* about the best single-driver



PURTON STATION, SWINDON–GLOUCESTER LINE.
Photograph taken in 1885.

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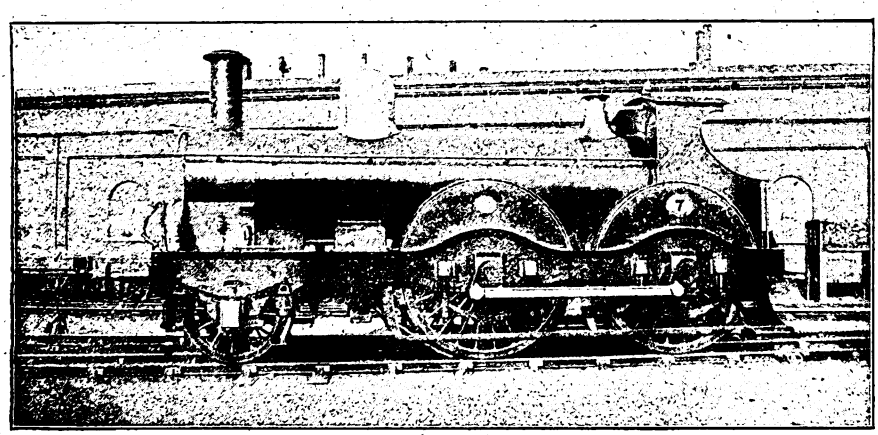
express engines that ever ran on rails. They were remarkably fast runners, and could beat the 7 ft. "Sir Alexanders," though the latter could take a somewhat heavier train. Nevertheless, I always considered that the line from Swindon to Neath was not the one upon which they were seen to the best advantage. The trains were fairly heavy, and the road over the Cotswolds between Swindon and Gloucester is a very difficult one. The rise on the up journey from Stroud to Sapperton Tunnel is extremely steep, some four miles being about 1 in 70, with bits of 1 in 60, in fact, this stretch is considerably harder than the famous Shap bank of the London and North Western Railway, for not only is the worst gradient more steep, but the line also runs along the hillside in a continuous series of sharp **S** curves. But in spite of these difficulties the 69 to 76 class of "singles" did some wonderful climbing with trains up to about 130 tons, though with loads above this a bank engine was usually employed in the rear to push the trains up.

On one occasion, with the slow up Sunday afternoon train during a severe snowstorm, the 7 ft. "single" *Prince Christian* No. 1118 started from Brimscombe without the bank engine and stuck fast at Frampton Crossing until an urgent wire brought the missing pilot post haste.

The bank engine in the rear was not, however, an unmixed blessing, especially on coal trains, though with the latter it was an absolute necessity. When coming over the summit at the eastern end of Sapperton Tunnel the train engine had necessarily to shut off steam to prevent "snatching" the wagon couplings. But the "banker" would frequently keep on pounding away, and bump the coal wagons against the tender of the train engine in such a forcible manner that the latter would be suddenly propelled forward. On one such occasion I was tumbled over backwards on to the tender with an avalanche of Welsh coal on the top, from which the driver had to excavate me.

An interesting illustration of Purton station, on the Swindon–Gloucester section, is shown as it existed in 1885, with one line laid with the old "baulk" road and the other with the newer transverse sleepers.

In 1887 the 69 to 76 class were transferred, four to Gloucester, and four, I believe, to Bristol. Their career as "singles" ended in 1895–6, when Mr. Dean converted them to four-coupled engines and dignified them with the names of rivers: *Avon, Dart, Dee, Exe, Isis, Stour, Teign* and *Wye*, and a few of them were at work until recently. They then replaced the "Sir Daniels" at Oxford, but after some years were sent to Trowbridge and Bristol, and were frequently to be seen on the Bristol and Exeter services.



FOUR-CYLINDER COMPOUND 2-4-0 ENGINE NO. 7. SWINDON, 1886.

The spring of 1886 saw the appearance of the "narrow gauge" four-cylinder compound engine No. 7. Like the broad gauge No. 8, which has already been described, No. 7 was constructed on the tandem system, with the low pressure cylinders in front, but the arrangement of the motion was quite different. No. 7 had both low pressure and high pressure pistons on the same rod, which passed through a brass bush in the partition between the two cylinders. I have already described the little peculiarities of No. 8, and merely add that No. 7 had some of her own, though of a different nature. They caused some trouble, but luckily did not produce

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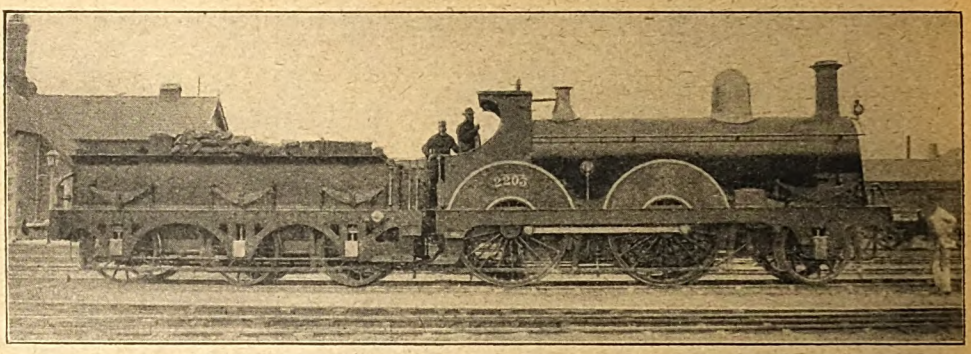
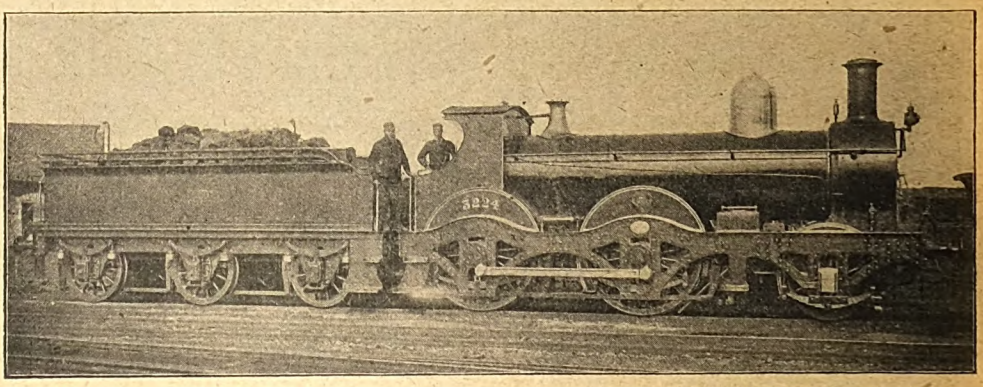


2-4-0 ENGINE NO. 2203 (2201-2210 CLASS), AS REBUILT AT SWINDON 1885-6.
6 ft. 6 in. coupled wheels, cylinders 17 in. by 24 in.

the shrapnel and high explosive shell effects that were characteristic of No. 8. The engine was of the 2-4-0 double-framed pattern, of the outward appearance of an ordinary engine; in fact, the untrained observer would have noticed nothing peculiar about her. The coupled wheels had a diameter of 7 ft., and the cylinders were: high pressure 15 in. diameter, low pressure 23 in. diameter, with a common stroke of 21 in. The slide valves of the high pressure were above, and those of the low pressure below, the cylinders, and the two valve spindles were connected together by a bent cross piece. The engine carried 180 lbs. pressure. I had a good many trips on this engine; and the first thing we discovered was that the extreme outside points of the coupling rod pins just managed to strike sparks from the coping stones of one or two platforms on the Swindon-Gloucester road. I am not sure whether this was remedied by slightly facing down the pins, or whether the engineering department was induced to give the offending platforms a shave. But the chief source of trouble was the bushes between the high pressure and low pressure cylinders, through which the piston rod passed. These were not accessible, and very difficult to oil, so that when the engine appeared to be going well the bushes would suddenly seize and score the piston rods badly. No. 7 did rather more work than No. 8, being employed more or less intermittently on slow trains to Cardiff and back, but the bushes were the cause of so much trouble that the engine was withdrawn at the end of 1887, and spent some years in the erecting shop with No. 8 before being finally completely renewed in 1894 as the present No. 7 *Armstrong*. After the experiences of engines Nos. 7 and 8, compounding had a holiday on the Great Western Railway until 1902-3, when the present four-cylinder "de Glehn" engines were purchased from France.

In addition to the singles of the 69 class, Swindon also had half-a-dozen 6 ft. 6 in. coupled 2-4-0 engines, 2205 to 2210, which worked two turns to Weymouth, one to Neath, and one on Saturdays to Taunton.



Photo] [*Locomotive Publishing Co., Ltd.*

2-4-0 ENGINE NO. 3224 (3206-3225 CLASS). SWINDON, 1889.
6 ft. coupled wheels, cylinders 18 in. by 24 in.

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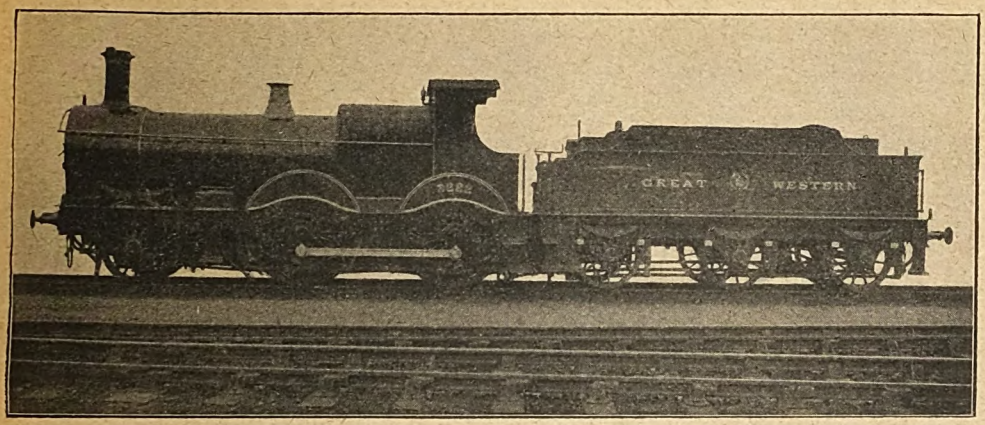


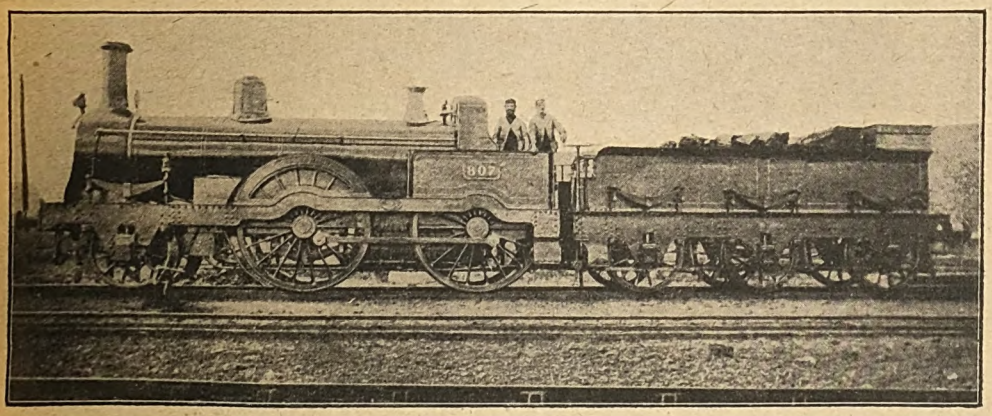
2-4-0 ENGINE NO. 3222 (3206-3225 CLASS), AS REBUILT.

The Neath turn was one of those old-time trips that do not exist in these modern days; life is much too short for them now. Coming on duty at 6.50 a.m., the train left Swindon at 7.50 a.m. for a 262-mile run to Neath and back. There were 32 intermediate stops in each direction—64 in all—and two hours at Neath. We reached Swindon at 8.5 p.m., and booked off duty at about 9 p.m., having had all we wanted.

The 2201 class were not the engines that were better known on the Great Western Railway after they had been rebuilt. They were almost similar to the 808 class, with open splashers to both driving and trailing wheels, but unlike the 808 class, they had domeless boilers with a small heating surface of only 989 sq. ft. In this respect they seemed to have been copied from Mr. Patrick Stirling's Great Northern practice. They were not very successful, and in 1886 they were rebuilt at Swindon with much larger domed boilers and closed splashers of a distinctly Midland pattern, after which they were excellent engines.

In 1887 the Swindon links were rearranged, and 2201 to 2210 had charge of one London turn, three Neath turns and one Cardiff turn *viâ* Gloucester, one Neath turn *viâ* the Severn Tunnel, two Weymouth trips, and a Saturday makeweight to Taunton. This gave plenty of scope for learning roads.

On the London turn they came down with the 5.10 p.m. express from Paddington to Reading, a train that probably conveyed more slip coaches than anything in that way hitherto invented. Slip coaches were always a feature with the Great Western Railway, and the 5.10 p.m. enabled the authorities to carry out unlimited ideas in this direction. We left Paddington with 16 six-wheeled coaches, with a 45-minute non-stop schedule to Reading—36 miles. At Slough we slipped five coaches for Windsor, dropped three more



2-4-0 ENGINE NO. 807 (806-825 CLASS). SWINDON, 1873.
6 ft. 6 in. coupled wheels, cylinders 17 in. by 24 in.

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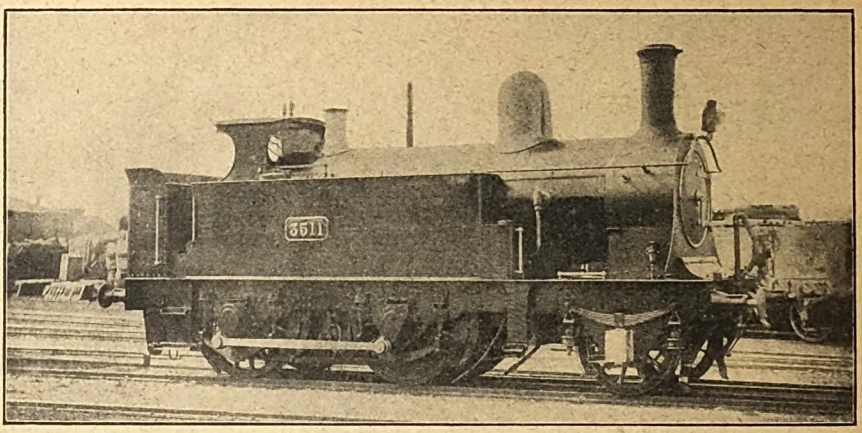

2–4–0 TANK ENGINE NO. 3511 (3511–3520 CLASS). SWINDON, 1885.
Coupled wheels, 5 ft. diameter, cylinders 17 in. by 26 in.
Subsequently converted to tender engine.

at Taplow (where these went to I do not know), shed another three at Twyford for Henley, and finally pulled up triumphantly in Reading station with only five of our original eighteen carriages. But the fun did not end at this point, for we generally managed to arrive with a number of passengers who ought to have been in the Slough, Taplow, or Twyford slips, and the noisy objurgations which these people emitted when they discovered that they had arrived at where they did not want to be can be better imagined than described. Despite the most frantic efforts on the part of a perspiring army of Paddington ticket collectors, some five per cent. of the passengers either got rounded up into or stowed themselves away in the wrong portions. The average number of "bulls" scored was about 95 per cent., the remainder were "outers."

Returning to the South Wales service, the Severn Tunnel now for the first time comes into the story. Prior to 1885 a service of stopping trains took Bristol passengers to the ferry, whence they crossed to Portskewett Pier, and entering another slow train, concluded an extremely uncomfortable journey to Newport and Cardiff. In 1885 or 1886 the Severn Tunnel was opened for passenger traffic, but for some months only local trains between Bristol and Cardiff used the tunnel, and it was early in 1887 before the first main line express from London passed through. I was on the engine —2201 class—very frequently during the first two months of the new working. The train was the morning express from Paddington, which was divided into two South Wales portions at Swindon, the first of which left there at 12.25 p.m. for Milford *viâ* Bath, Stapleton Road, and the Tunnel, and the second portion took up the working of the old train to Swansea *viâ* Gloucester. One corresponding up train was worked by the Neath engines. A year or two later the two down portions were completely separated, and the Severn Tunnel portion left Paddington at 9.45 a.m. and Swindon at 11.30 a.m. In 1890 a new down express was put on to leave Paddington at 3.10 p.m. over the new route, and a corresponding up train from South Wales reached Swindon at 4.28 p.m. But the old Milford Boat train—the 5.45 p.m. down—remained on the route *viâ* Gloucester for several years, as also did the corresponding up train and the mails in both directions. When the tunnel was first opened for local trains it was worked from Bristol by 2–4–0 double-framed tank engines of the 3511 class, which had condensing apparatus fitted after the manner of the Metropolitan tank engines. The new large tunnel ventilating fans, however, rendered the use of the condensing tanks unnecessary, and they were taken off these engines.

I have omitted to add that the 2201 class had 17 in. by 24 in. cylinders, 6 ft. 6 in. coupled wheels, 1,258 sq. ft. of heating surface, and 140 lbs. pressure. A second set of ten engines, 2211 to 2220, were very similar, but had domeless boilers. In 1889 the 2201 class were replaced at Swindon by the new and larger 3206–3225 class, which had double sandwich frames and outside cranks. These engines had 18 in. by 24 in. cylinders, 6 ft. coupled wheels and 160 lbs. pressure, and were considerably more powerful. They were very handsome machines.

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but their present-day appearance has been considerably marred by their new and unprepossessing-looking boilers. They may frequently be seen at Paddington, where they run from Oxford and Trowbridge.

But the Swindon engines shared the South Wales service with Nos. 808 to 825, all of which, except 810 and 821, were in this part of the country. These were 6 ft. 6 in. coupled engines with 17 in. by 24 in. cylinders, and had been built by Mr. J. Armstrong in 1873. They were excellent "steamers," and were very well liked by the men, and of the sixteen in the South Wales district, about ten were at Neath and the remainder at New Milford. The Neath engines worked two turns to Swindon and one to Gloucester, and also ran two or three turns to New Milford. The engines stationed at the latter place ran to Neath only, except that, if my memory is correct, they worked the mail train as far as Cardiff on Sundays only. There had been two or three of the 2201 class in their original condition at Carmarthen, but these were removed in 1887 and replaced by other engines. Gloucester had no tender main line engines for South Wales work, though 2–4–0 tank engines worked slow trains from there to Cardiff. After the two 7 ft. singles Nos. 1122 and 1123 had been removed from Gloucester, Nos. 73 to 76, which replaced them, worked only to Swindon and to Hereford, but after 1888 the Hereford 6 ft. coupled engines with double frames, 114, 374, 376, 377, 1007, etc., ran one train to Swindon.

(*To be continued.*)

A STRIKING VIEW ON THE GRAND TRUNK PACIFIC RAILWAY.

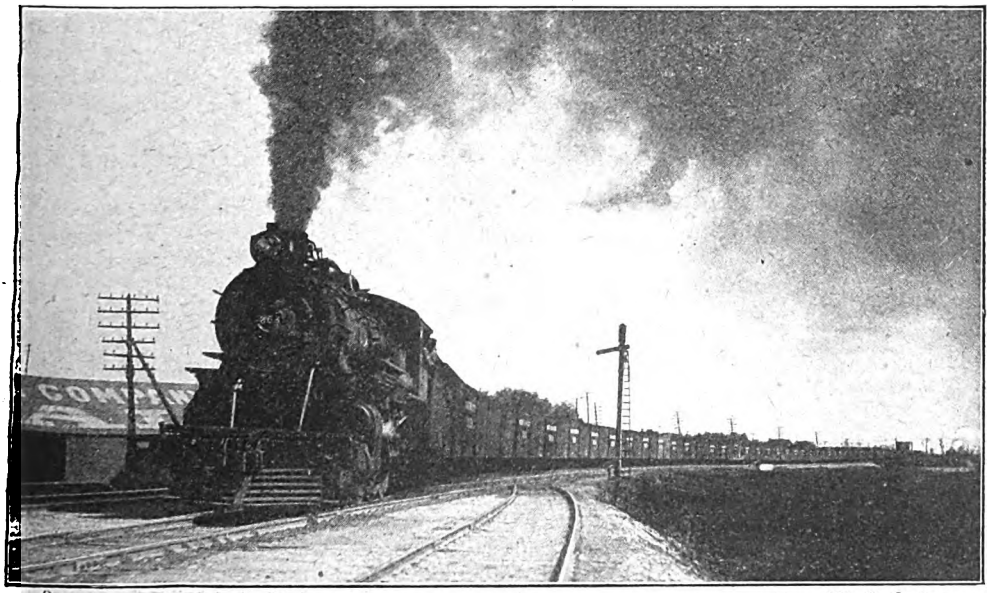

Photo. [*R. C. Carter.*

WESTBOUND FREIGHT TRAIN PASSING THROUGH FORT ROUGE YARDS, WINNIPEG.
2–8–0 engine, No. 868.

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Railway Electrical Progress and Practice.

AN ALL-ELECTRIC MAIN LINE RAILWAY OF THE FUTURE. [No. II.]

By "INDICATOR."

LAST month the main features of the "Rayhampton, Marsden and Belmont Railway," as imagined by our prospective author of 1935–1940, were outlined. The principal particulars of its development leading up to its becoming the first railway of considerable magnitude to work all traffic—express, ordinary passenger, local, suburban, goods, mineral, shunting, etc.—electrically, were set forth. Our *futurist* contributor, in this instalment, deals with more directly electrical aspects. To avoid the frequent necessity for referring back to the first article, the detail map of the Rayhampton suburban area is supplemented by a sketch map of the northern portion of the system, these maps also showing the locations of power and sub-stations.

As already mentioned, the system which has superseded original installations of electric traction consists in the use of single-phase alternating currents and these are supplied through overhead conductors at a pressure of 20,000 volts, 25 cycles. As the distances involved are considerable, and some 1,000 miles of track are involved, largely for busy traffic, current is supplied from five main power stations and 21 sub-stations, including those located in power station buildings.

Experience had shown the great economy to be derived by combining in one station the supply for all purposes, and thus gaining the great advantage of that considerable diversity factor which tends so greatly to improve the load factor. In order to obtain this the railway company had formed, jointly with other large industrial interests in the country served by it, a separate power supply undertaking, having the right of way for its transmission lines along the railway, and canal tow-paths.

By this means current for working the mines, for chemical and metallurgical purposes, as well as for power, heating and lighting, could be supplied at low rates such as but 15 years previously would have been ridiculed. The interests of existing electrical undertakers had been safeguarded by appointing them the distributing agents for the area covered by them and rendering it thus possible for them gradually to shut down their existing stations and to benefit by the economy in cost of production rendered possible by this means.

In the Rayhampton area there are two power stations, one near to Burn Road station, and the other adjacent to Norford Junction. These are somewhat close together, but were installed at different periods, it being found preferable to erect the latter of these on an entirely separate site rather than to enlarge the earlier station at Burn Road, where extension was not altogether convenient. The provision of a second station was also found desirable in that while several sections still remained to be electrified the equipment of the Norford Junction station enabled the Burn Road station to be placed out of action and remodelled on a more modern basis ready for the time when both would be required.

As soon as the Norford Junction was put into operation Burn Road was gradually reconstructed and in it were installed five 100,000 k.w. steam turbo-alternators with large-unit boilers supplying highly superheated steam at a pressure of 350 lbs. per sq. in. This station as soon as completed was run continuously 24 hours per day on its full load, one generator being kept as a stand-by for overhaul and repairs. All the regulations and the peak loads were, on the other hand taken up by Norford Junction station which for this purpose was equipped with two 25,000 k.w., four 50,000 k.w., and two 75,000 k.w. turbo-alternators.

Steam was retained as it was still found preferable for large scale work of this class, notwithstanding the development of the internal combustion motor using relatively inferior fuels, especially seeing that the

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Marsden Railway has its own access to a favourable coal area.

If need arises, the whole of the suburban system can be run from either power station, though this has only three times been necessary during periods of heavy traffic, since the whole of the lines have been so worked.

Normally, the Burn Road station controls the supplies of all the western lines, including the joint section from Weston to Exholme, with the connecting lines between Carbury Road, Stella Road, Ashford Junction, and Norford Junction, these latter all being supplied through one of the two sub-stations also located in the power house. This sub-station is known as Burn Road No. 1. It also supplies the three sets of sidings near Ashford and their connections with the various Ashford traffic junctions. The other sub-station covers the area from Burn Road to Stoneford Junction, New Park to Notbrook, Lexington Place to Exholme, St. Anne's Junction to Burn Road and Albert Park and New Park to Stoneford Junction. The other sub-stations supplied from Burn Road are those at Leigh (for the whole of the Johnstone route beyond Stoneford Junction), and Exholme, for the Chillington extension.

Norford Junction power station controls the supplies of Burnett Place sub-station, which is a dual one, the two sections serving respectively the Central station, approach lines thereto, and access to the Moortown goods depôt; and the Burnett Place–Carling Road, and Burnett Place–New Park sections. A sub-station formed in the power house itself serves the North and South Bentley routes and dock and other connections, while a sub-station at Tillingford supplies the main line from Ashford Junction to Steynbrook and the branch from Tillingford to Westbrook. A sub-station at Ashwell Junction supplies the Osborn Street route and the Oxwell branch.

As the distances are not great and uniformity was desired, current generated at 20,000 volts is supplied at that pressure to the sub-stations, which are, in effect, distribution centres rather than sub-stations as ordinarily understood. These sub-stations were installed, in fact, with the idea of de-centralising distribution, and while each can be supplied from either power station, they can also be linked up with adjacent sub-stations, so that, for example, Stella Road can be joined up with Norford Junction sub-station or with Burn Road No. 1 (serving the Ashford district lines), instead of taking current direct from the switchboard at Norford Junction or Burn Road.

The object of this is that should a breakdown occur, or repairs be required, on a main connection from Burn Road or Norford Junction power stations to any sub-station, distribution can be effected *viâ* one of the sub-station switchboards. This facility has several times avoided a temporary cessation of traffic on certain sections, while it enables either the main distribution cables or the sub-station inter-connecting cables to be placed out of action if required. All the changes rendered possible by this system of inter-connections are, in practice, utilised on Sundays, portions of Burn Road and Norford Junction power stations being shut down alternately for attentions to the switch gear and safety devices. Similarly, by means of auxiliary switches, several of the sub-stations can be made to replace one of those adjacent even in respect of its system of distribution, and this in addition to the alternative means of supply referred to which only relates to main supplies of each station.

This rather elaborate system of interconnections and alternatives was introduced partly in consequence of the gradual extension of electrification which allowed of new connections and modified distribution arrangements being installed in addition to, instead of actual replacement of, those first installed; but at the same time possessed the advantage that, although duplicate connections are provided, they are in no respect exact equivalents, thereby presenting wider possibilities of usefulness than direct duplication would offer, and with less capital outlay.

At Seastone is another large power station, erected primarily to serve the docks and shipping equipment there, but since reconstructed to serve also the main line from Steynbrook to Caxton and thence to Kenton. In this case the equipment is in two entirely independent sections. No. 1 portion, the older, generates at 20,000 volts for the docks at Seastone and also supplies the Stuart–Alford-on-Sea and Seastone railway routes. This includes five 15,000 kilowatt sets. No. 2 section has four 25,000 kilowatt sets, with step-up transformers supplying duplicate transmission lines at 100,000 volts to the Fairgrove and Caxton sub-stations. These transmission lines are interconnected by means of a duplicate 200,000 volt transmission line with the Burn Road and Norford Junction power stations.

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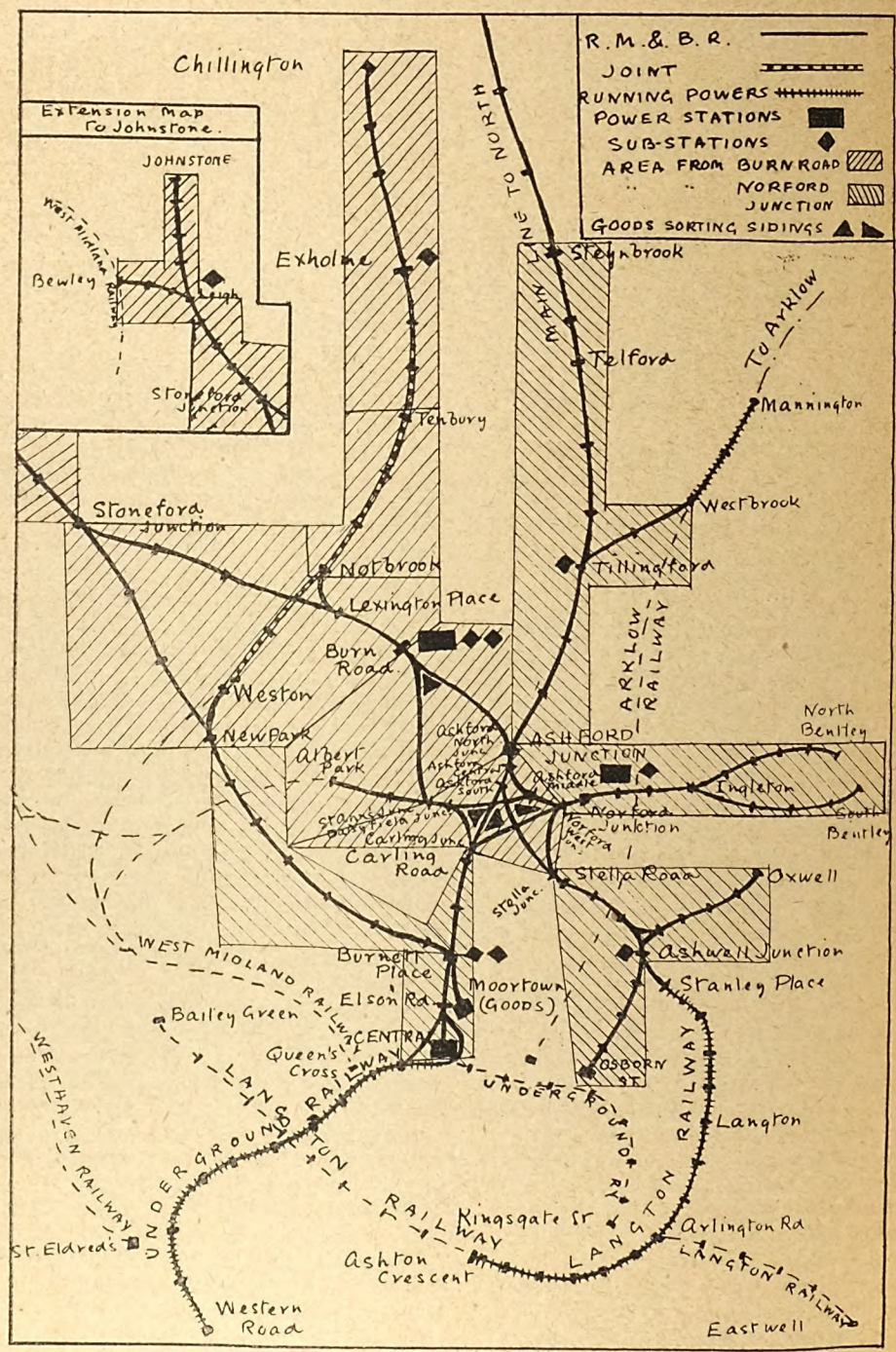

RAYHAMPTON, MARSDEN AND BELMONT RAILWAY.
Map of southern section, showing location of power and sub-stations, electrical distribution areas, etc.

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In this double power station at Seastone large internal-combustion turbines are used, largely owing to the fact that they were installed for the original plant, and as results were favourable, their employment was developed and extended. As a port Seastone is also convenient for receiving oil supplies from abroad.

Cantwell power station serves the whole of the north-eastern lines, the main line to Ellington Junction and the branch thence to Kenton. Here internal combustion motors are installed using coke oven gases and working in conjunction with steam turbo-alternators, but transmission to the sub-stations at Farnworth, and Ellington Junction is at 60,000 volts which enables cables to be used as, owing to local conditions, overhead transmission was not thought advisable. For the Marsden area there is a very big power station at Sandling (including a sub-station for the Marsden–Rixford line), with a double sub-station at Marsden (one for the local lines, and the other to Kenton and Iston), one at Ashton for the western lines, and one at Drayton for the eastern lines together with the extensive goods yards at Drayton, though the Orwell–Penton section is supplied by the Easthampton Company, with whom it is joint. At Sandling there are six 75,000 kilowatt sets operated by steam turbines. This station is also connected with Seastone by means of a duplicate transmission line.

Adopting the same principle as is found in the Rayhampton area, there are in all cases duplicate connections for the main supply, and in several instances alternative connections with power stations can be made. Thus while Seastone has no alternative for its own purposes, though No. 2 can be served through No. 1's connection if required, Fairgrove can be supplied through Caxton, and in an emergency even from the Rayhampton stations by extension from Steynbrook (this entails a considerable drop in voltage, and may require a reduction of service). Similarly, Caxton can be connected up with Ellington Junction, or with Kenton sub-station. In the Marsden area the sub-stations are inter-connected in the same way as are those in the Rayhampton area, but in other cases they are only inter-connected as indicated to provide an alternative main supply and not for distribution purposes.

At an early period in electrification the Marsden Company decided that for general purposes the use of electric locomotives was imperative, if only to allow, on the passenger side, for utilising existing rolling stock. In fact, even at this period, when in the course of the last ten years or so large numbers of vehicles have been built with a direct view to employment in electric traffic, it is only in the Rayhampton area that motor-car trains are used, the electric locomotives being universal elsewhere.

These locomotives are of two principal passenger classes, the only difference being the sustained speed capacity provided for. These are, respectively, for express and ordinary passenger traffic, and there are two goods classes, one adapted for road service and the other more particularly for local work involving a considerable amount of shunting. There are also several locomotives designed expressly for yard and like shunting. Design is, however, standardised to a large degree. In practice either passenger class can be used for almost any train, except that the secondary class cannot be used for one of the special expresses. On the other hand, the primary class cannot take quite so heavy loads as the others.

Of the goods engines the superior class is adapted more for sustained running at moderate speeds, but the motors are geared for greater tractive effort than either of the passenger classes. The alternative series allows of special power being exerted when required, as often occurs in such shunting as is performed by road engines on "pick-up" goods trains. The shunting engines are designed for heavy intermittent work, and in busy yards often work 24 hours a day for a week at a time.

As a rule the classification of duties given to the respective series of engines is not a very strict one. Thus, A class passenger engines are also used for secondary duties, and occasionally even for through goods trains of reasonable weight. B class passenger engines similarly work fast trains on services not involving long high speed runs, and occasionally even on more special duties. They are also frequently used for through and ordinary goods trains. Goods engines of class C are more particularly intended for ordinary goods trains, but it is by no means unusual for them to work local and intermediate passenger trains. D class goods engines are, however, kept fairly rigidly to pick-up, local and heavy through goods and mineral trains. The shunting engines (class E) are employed at Seastone docks, and in the sorting sidings near Ashford Junction for local distribution journeys radiating

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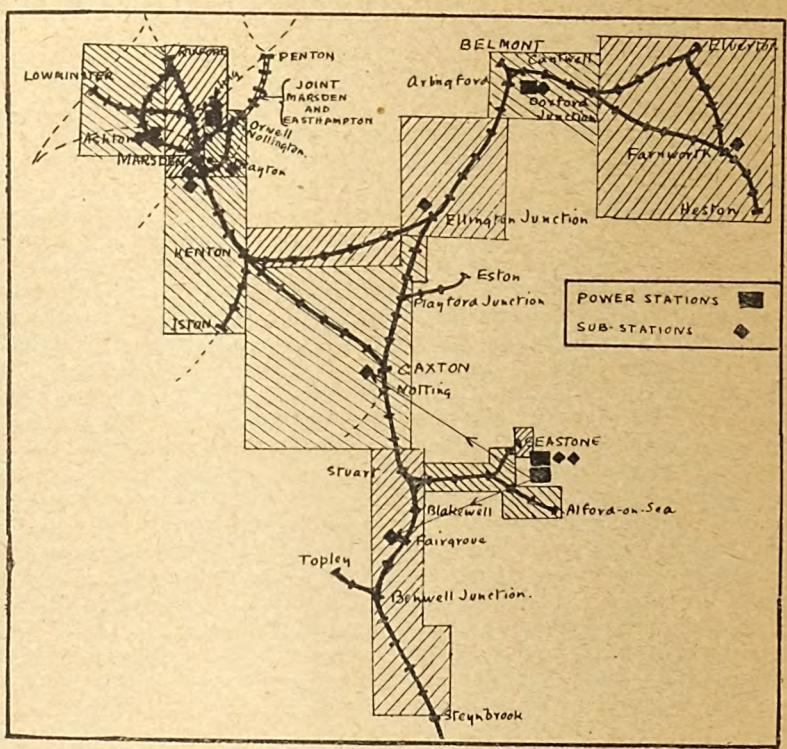
therefrom, and in the Marsden district; but a few others are used as station or depôt shunters, as at Rayhampton Central station, Moortown goods depôt, Caxton and Bentley goods yards, Farnworth, Heston and one at Rixford dealing with exchange goods traffic with the Northern Railway.

In external features all these engines are very similar. Classes A and B are each of the double bogie type, the end axles being for carrying wheels only, and the others motor driven. The leading and trailing wheels are small, 3 ft. in diameter, but in order to take large motors directly connected to the axles and with regard to the desired speed capacity, the driving wheels of class A are 6 ft. 6 in. in diameter and of class B only 5 ft. Goods classes C and D have four motors, so that all wheels are driven. Wheel diameter is 4 ft. 6 in. in the former case and 4 ft. in the other. The shunting engines correspond very closely with the road engines of class D, but the motors are wound and geared to suit their particular duties.

As a rule engines work in pairs except when taking short trains, and a general practice is to place them one at each end. This is done regularly in the case of goods trains, as it avoids all risks due to breaking in two, and is often convenient for making-up or dividing trains in the goods yards and sidings.

For the passenger engines this practice is also employed where desirable, as it enables the respective engines to work division portions with a minimum of shunting. In this connection it may be mentioned that virtually all regular passenger train vehicles, including bogie luggage vans, and milk, fruit and fish vans, are wired to supply multiple-unit connections, so that it is only necessary to connect up the standard end fittings of adjacent vehicles, to provide for multiple-unit working.

This method was adopted principally in view of the fact that a large proportion of Marsden Railway passenger traffic is worked with standard sets, adapted to be used alone



RAYHAMPTON, MARSDEN, AND BELMONT RAILWAY.
Map of northern section showing location of power and sub-stations, electrical distribution areas, etc.

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or in composite make-ups; and as the cost of the connections is relatively light per vehicle it was decided to equip all regular passenger train coaches in this way. In addition, in the case of standard units, it is usual to provide at what is normally the rear end with reference to the usual position of locomotives a motorman's compartment whence he can control the locomotive, though such vehicles are not motor equipped. In view of the front position of such compartments, when running with the locomotive behind, the carriage bogies which then lead are built heavier than others. A number of vehicles are also so fitted in order to permit of varying the make-up and of strengthening sets, so that it is only occasionally that it becomes imperative to place the locomotive at the head of the train or to re-make up to obtain a control compartment leading.

In order that the advantages realised by these methods of working may be appreciated it will be convenient to describe how standard train services are usually operated.

For the Rayhampton–Marsden services, on which there are through express trains, apart from the through joint stock trains continued north of Rixford over the Northern Railway, standard trains are made up of from two to five coaches working between Rayhampton and Rixford, two for Penton and two for Lowminster. When the total is only six or seven vehicles one class A engine only is employed, but with seven or more cars two are used, one at each end, in view of the high average speeds involved on these services, which constitute the most valuable feature of Marsden Railway passenger traffic. When thus "dual-operated"—this term appears better than "double-heading," which is not strictly correct—on arrival at Marsden the leading engine goes on with the Rixford portion, and the rear engine takes the Penton coaches in the opposite direction *viâ* Drayton. Another engine works the Lowminster portion after the Rixford portion has gone, travelling *viâ* Ashton.

Each of the three portions has a motorman's compartment, at the south end in the case of the Rixford and Lowminster sections and the north end of the Penton sections. Consequently, in returning the locomotives are not altered in position and are controlled from the motorman's compartment, the Penton and Lowminster portions arriving first and being brought together by their own engines, and the Rixford portion being then added after removal of the Lowminster engine. All these sections are thus worked north of Marsden with locomotives in rear, and at Marsden the Penton engine then takes charge of the train, with the Rixford engine in rear, the Lowminster locomotive being detached.

If such portions are strengthened for the heavier services by usual vehicles the same procedure is adopted; but when it is necessary to attach horseboxes and the like the locomotives are placed in front, unless such extra vehicles are only being conveyed between Marsden and local towns, in which case they are sometimes worked behind a locomotive in rear. On the fast schedules between Marsden and Rayhampton however, though additional vehicles are occasionally worked behind a rear locomotive, the engine is always placed in front should there be only one employed.

As either locomotive can always move even the heaviest passenger trains unaided, though they may not be able to work them on high speed schedules, the provision of two engines is often of the greatest service in breaking-up or combining trains, or transferring, attaching or detaching vehicles, and many operations are carried out which would be inconvenient, if not impracticable, without the assistance of another engine, were all power placed at the head of the train.

For the through joint trains to and from the Northern Railway the two engines always required are necessarily placed at the head of the train, the joint rolling stock not being fitted with through connections, and these trains being very liable to convey additional and foreign coaches and vans.

On the Belmont route it is usual to combine Seastone and Alford-on-Sea portions, Stuart being the dividing station. A usual make-up is five coaches for Belmont—continued locally to either Elverton or Farnworth and Heston—three for Alford-on-Sea and two for Seastone. A locomotive is placed at each end of the train for "dual-operation" to Stuart. Thence the front one proceeds onwards to Belmont, while the rear engine takes the Alford portion in the opposite direction. A local engine works the Seastone coaches on the branch.

Returning, the sections are operated from motor-men's compartments, and operations reversed; but it is necessary to acknowledge that such methods are usually more theoretical than practical, at least in part, seeing that both the Belmont portions (largely on account of Heston and Farnworth traffic) and the Seastone sections frequently have additional

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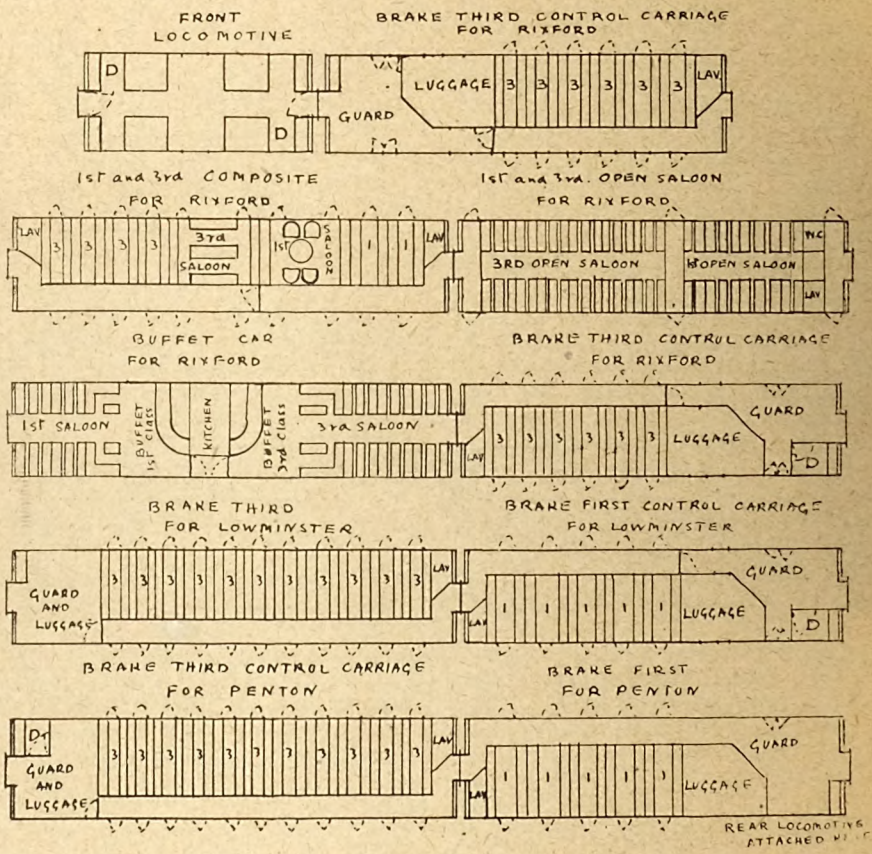
vehicles attached requiring them to run with locomotive in front, and in the case of several services every day it is not more than once in three times that the usual methods can be maintained. Matters are, however, greatly simplified by the fact that virtually every train has two engines between Rayhampton and Stuart, each independently available for station work.

Nearly all other services outside the Rayhampton area are worked with four vehicles and a class B locomotive, controlled for rearward working from a motor-man's compartment. This applies also to the Rayhampton–Johnstone route—two vehicles for Johnstone and two for Bewley as a rule—the Rayhampton–Chillington route, and the special Arklow trains, and where more than one or two additional vehicles are required, it is the general practice to combine two sets and work eight coaches with engines in front and rear.

For the Rayhampton local services motor car sets of six or seven cars, divisible into three or four and three are generally employed, but at busy periods some of the locomotive-operated single or double trains work also on these routes as required to amplify the car sets. From Osborn Street the local traffic is operated in the same way as from Central, but the Oxwell route never requires more than four cars. For the through Underground services car trains only are used, except for a few special expresses to Arklow, Johnstone and Chillington run to suit outer suburban residential traffic. These, together with fast local trains to Steynbrook (car trains used for this), are few in number and run only at the hours of business travel. The standard practice is to confine Underground working to the Western Road–Central–New Park–Stoneford Junction route, exchanges being made at Burnett Place.



PLAN OF STANDARD RAYHAMPTON-MARSDEN, RIXFORD, LOWMINSTER, AND PENTON BUFFET CAR EXPRESS.

D = Driver's control position (on locomotive) or control compartment on train.

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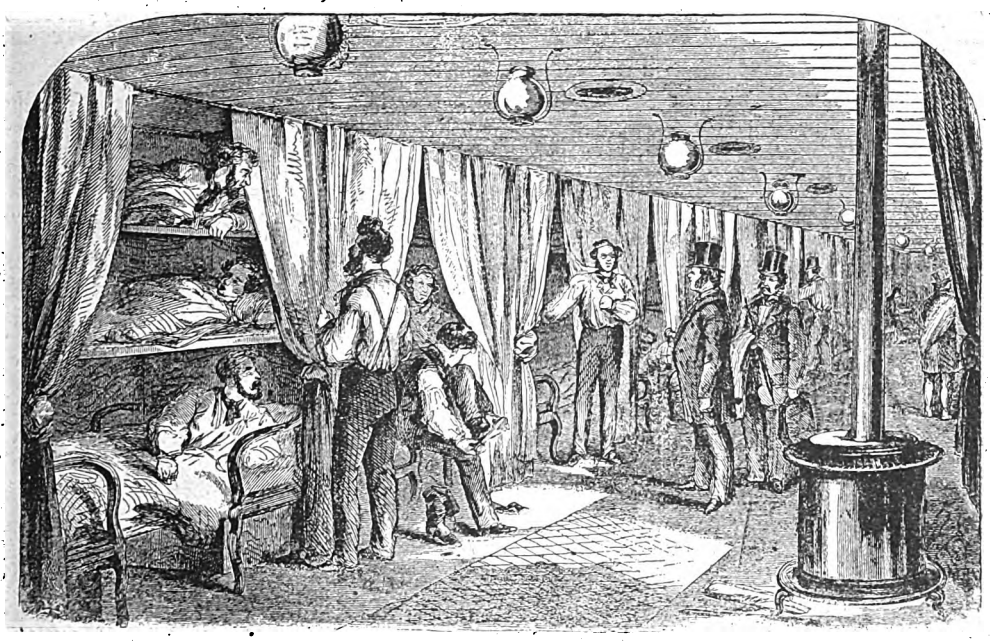
An Original Sleeping Car: New York Central Railroad.



THE sleeping car is now so usual a feature of railway travel, in the form of Pullman vehicles in the United States and similar coaches on European railways, with the more private and in many respects preferable cars as used on our own lines, that it is difficult to realise the peculiar interest which the pioneer "sleepers" aroused.

The view above reproduced is taken from an old American journal, *Frank Leslie's Illustrated Newspaper*, dated April 30th, 1859; and the following comments thereon may be quoted:—

"In days gone by travellers might well have imagined that it was the object of the proprietors of public conveyances to render them as uncomfortable as possible. Now, at least in this country, it appears to be quite the reverse.

"Formerly travelling, amongst other inconveniences, implied a total abstinence from sleep, or if indulged in, it was in such an uneasy posture that the sleeper awoke more fatigued than before. Now American ingenuity has invented a sleeping car, which is in use on several of our long lines, in which, for a small increase in the fare, the traveller may enjoy his natural rest and yet not be retarded in his journey.

"Our illustration was drawn from one of the cars in use on the northern branch of the New York Central Railroad, on which line sleeping cars are attached to every night train. The cars may be used as ordinary day ones, but at night two shelves are let down from the ceiling and a third shelf is formed by letting down the backs of the seats. On each of these mattresses and bedding are placed, curtains closely drawn up during the day are let down, and the whole forms a very comfortable sleeping-place about the size of a ship's berth.

"We are glad to see that some of the railroad companies have adopted these cars. It is a step in the right direction which will, without doubt, be soon followed by the directors of other railroads. In a pecuniary point of view it will certainly be profitable, as without calculating for income from the increased travel which always follows improvements, every traveller would gladly pay an increased fare for the accommodation."

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ROAD AND RAILWAY BRIDGES CROSSING THE RIVER USK AT NEWPORT.

Newport (Mon.) as a Railway Centre.

By H. L. HOPWOOD.

THE town of Newport-on-Usk, or Newport, Mon., to quote its more familiar designation, is the third largest port in the United Kingdom for the shipment of coal. With a population approaching 100,000, and with a network of lines from the North, East and West converging on the town, its position as a railway centre is of considerable importance.

Newport's connection with railways and locomotives goes back for more than 100 years, for it was in 1805 that the town became acquainted with its first railway. This was the Sirhowy Tramroad, a mineral carrying line built to connect the Tredegar Ironworks and other industrial centres with the River Usk at Newport.

Newport can also claim to have taken part in the early history of the locomotive. About the year 1815 an engine was built there by a Mr. William Stewart, but unfortunately little or no information concerning it has been preserved. It is, however, known that Stewart, unaware of what George Stephenson and others were doing in the North, built an engine at Newport and sent it to Lydney to work on the Lydney and Lydbrook Tramroad. It appears that in 1814 a colliery company in the Forest of Dean was paying £3,000 a year for the haulage of coal by horses, and that Stewart offered to do the work with locomotive power, provided the colliery company paid him half the sum they paid for horse haulage, *i.e.*, £1,500 a year. This offer was accepted, provided the engine worked satisfactorily. At a trial the engine proved itself capable, but in the meantime the threat of the introduction of steam power had the effect of reducing the cost of horse haulage to £2,000 per annum, and when the engine was completed the colliery company offered Stewart only £1,000 a year, this being half the sum they were then paying for the carriage of coal. Feeling hurt at this treatment, Stewart abandoned the enterprise and left the engine with the colliery company in satisfaction of their claim for the money they had advanced

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for the engine's construction. What the subsequent history of this early effort was, is not known, but the probability is that the engine was laid aside and soon sold for scrap.

Referring again to the Sirhowy Tramroad, this line was worked by horses until 1829, when locomotives built by Stephenson for the Tredegar Ironworks were introduced. Thus locomotives have been working into Newport continuously for a period of 85 years.

So much for the early history of railways in the locality. At the present day the whole of the lines in the Newport area, with the exception of those of the Alexandra Docks and Railway, are the property of the Great Western Railway. Both the London and North Western and the Brecon and Merthyr Railways exercise running powers into Newport, the first mentioned railway joining the Great Western line at Nine Mile Point, and the Brecon and Merthyr Railway at Bassaleg.

A glance at the accompanying map will show that the main line from London to South Wales approaches Newport from the East, and curving sharply, proceeds to Cardiff in a south-westerly direction. This line was originally a portion of the old South Wales Railway of broad gauge, and was opened about 1850. On looking again at the map, a line down from Crumlin to Newport, and then up to Pontypool, roughly in the shape of the letter "U," is seen. These lines were known respectively as the Western Valleys and the Eastern Valleys sections of the Monmouthshire Railway, with passenger stations in Newport at Dock Street and Mill Street. The Pontypool, Caerleon and Newport Railway which runs to the east of, and nearly parallel with, the Eastern Valleys line, from Pontypool Road through Caerleon to Newport (Maindee Junction), is of more recent construction, dating from 1874. When the Monmouthshire Railway was absorbed in 1880, the Great Western Railway were enabled, by the construction of two short connecting lines, to divert all passenger traffic to High Street station. These lines were the Gaer Loop on the western side of Newport, and the spur line from Cwmbran on the Eastern Valleys line to Llantarnam on the Pontypool, Caerleon and Newport section; and since that time Dock Street and Mill Street stations, and the line from Park Junction (Western Valleys) to Cwmbran Junction (Eastern Valleys) have been used for goods and mineral traffic only.

There remain to be mentioned the lines of the Alexandra Docks and Railway. It is mainly due to the enterprise of this railway that Newport and its docks are in such a flourishing condition to-day. The company was incorporated in 1865, the Newport North Dock being opened on April 13th, 1875. The present title of the company—The Alexandra (Newport and South Wales) Docks and Railway—was adopted in 1882, and in 1897 they acquired the Pontypridd, Caerphilly and Newport Railway.* Until the end of 1898 the Alexandra Docks and Railway worked a passenger service between Newport, High Street and Pontypridd with their own engines and carriages, but since January 1st, 1899, the Great Western Railway have provided the rolling stock. The Alexandra Docks and Railway, however, still work mineral trains between Pontypridd and Newport Docks with their own engines. For some years this Company have been making extensive additions to their property. In 1904 they obtained powers to extend the South Dock by 48 acres, and in 1906 further powers were given to enlarge this dock to the extent of another 27 acres, and to construct a lock 1,000 ft. long and 100 ft. wide. These extensions were opened on July 14th, 1914, and at present the docks have a total deep water area of 125 acres, constituting the largest single sheet of deep water dock area in the world. The South Dock now measures 4,000 ft. long and 1,100 ft. wide. In 1911 powers were granted to the Alexandra Docks and Railway for the construction of a direct railway from Nine Mile Point to Newport Docks, but at the time of writing the work has not been proceeded with. The lines of the Alexandra Docks and Railway in the vicinity of Newport extend from the docks to the Brecon and Merthyr Railway station at Bassaleg, and run parallel with the Western Valleys line for the greater part of that distance.

The Great Western Railway in approaching Newport from the east, immediately before entering High Street station, crosses the River Usk by means of a fine girder bridge supported on nine stone piers and having a centre span of the bow-string type. This bridge was erected in 1888 and replaced a timber structure, which in turn had taken

* It is curious to note that two railways entering Newport from opposite ends bore the initials P. C. & N., *i.e.*, the Pontypool, Caerleon and Newport Railway and the Pontypridd, Caerphilly and Newport Railway.

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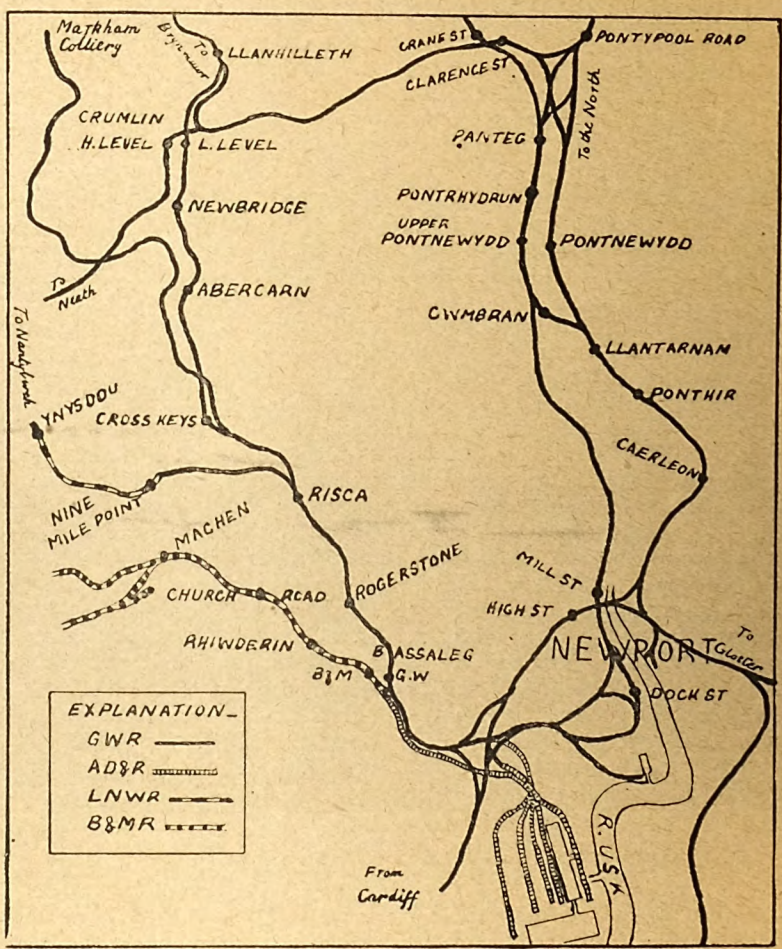
the place of the original bridge destroyed by fire in May, 1848, before the line was opened for traffic. At the Cardiff end of the station is situated the Hillfield Tunnel, 742 yds. long.

The congestion of traffic in the Newport area is very severe, and for some few years important widening works have been in progress. In 1912 the Hillfield Tunnel was duplicated, and at the present time the bridges over the Chepstow and Caerleon roads, and that over the River Usk, all on the east side of the town, are in process of being widened in order to accommodate four tracks. There are now four roads on the main line between Newport and Cardiff and four roads on the Western Valleys section as far as Risca. A few years ago the "control" system of working traffic was inaugurated in the Newport district.

High Street station is the original structure dating from the opening of the railway, but, of course, greatly enlarged and brought up to date from time to time. The station comprises two long platforms, the down platform, 897 ft. in length, having a bay at the west end, whilst the up platform, which measures 817 ft., is of the island type, so that four platform faces in all are provided. Between the up and down platforms there are four running roads. The station accommodation will soon be increased further so as to keep abreast of the ever increasing traffic.

With the exception of the main line from London to South Wales, the whole of the lines running into Newport were constructed



GENERAL MAP OF RAILWAYS IN THE NEWPORT DISTRICT.

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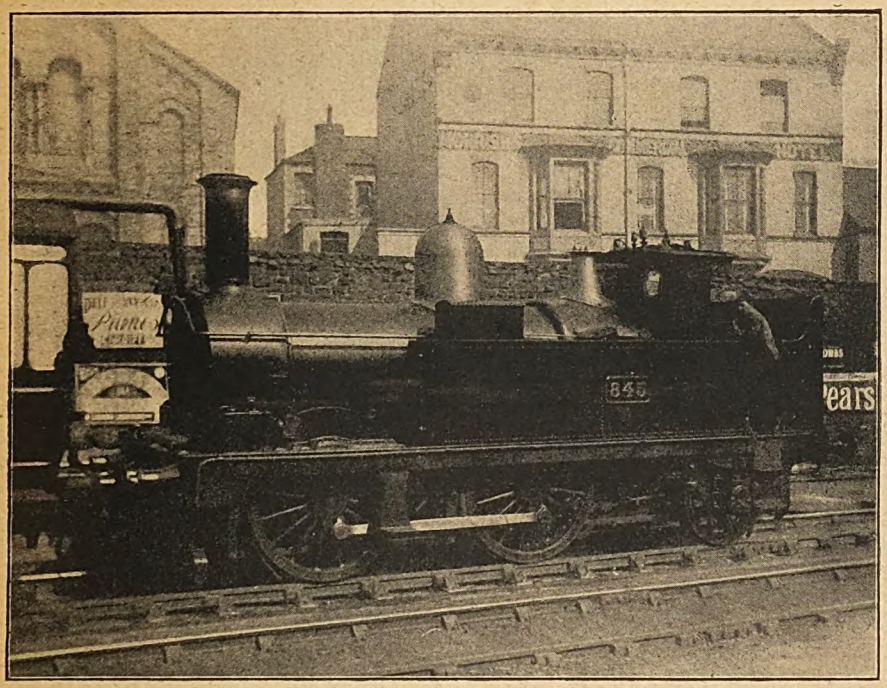
primarily for the conveyance of coal, iron and similar heavy traffic from the various pits and industrial works situated in Monmouthshire and East Glamorganshire.

From London to Newport three routes are available, and of these, the longest is that *viâ* Swindon and Gloucester, 158½ miles. This was the only route to Newport and South Wales until an alternative one was created by the construction of the Bristol and South Wales Union Railway in 1863, but the latter route was never very popular, as it involved a change at New Passage from train to ferry boat across the Severn, and then a change into another train at Portskewett. The opening of the Severn Tunnel in 1886 reduced the distance from London to Newport (*viâ* Bristol) to 143½ miles, and this distance was further reduced to 133½ miles when the Badminton line was opened on July 1st, 1903. The latter is the route taken by the principal South Wales expresses, but a few of the less important trains still travel *viâ* Bristol or *viâ* Gloucester. The three routes from London become one at Severn Tunnel Junction (the Badminton and Bristol lines having previously joined at Patchway) and form the South Wales main line through Newport and Cardiff to Milford and Fishguard.

Approaching Newport from the north west is the Western Valleys line from Brynmawr, where, at Aberbeeg it is joined by the branch from Ebbw Vale. At Llanhilleth Junction, near Crumlin, it throws off a short connecting mineral line with a steep gradient up to the high level line which runs across country from Pontypool to Neath. At Halls Tramway Junction, near Cross Keys, a mineral line comes in from Markham Colliery, and at Risca there is another branch from Nine Mile Point, at which station an end-on junction is formed with the London and North Western Railway branch from Nantybwch and Tredegar. Just south of Bassaleg a further junction is effected with the Brecon and Merthyr Railway main line.



Photo] [*H. L. Hopwood.*

GREAT WESTERN RAILWAY 0–4–2 TANK ENGINE IN NEWPORT STATION.

The Western Valleys line joins the main line outside Newport by means of two short connecting lines which diverge at Park Junction, one going in the direction of Newport, and the other towards Cardiff. Thus a triangle is formed, the east side of which is the Gaer loop, the west

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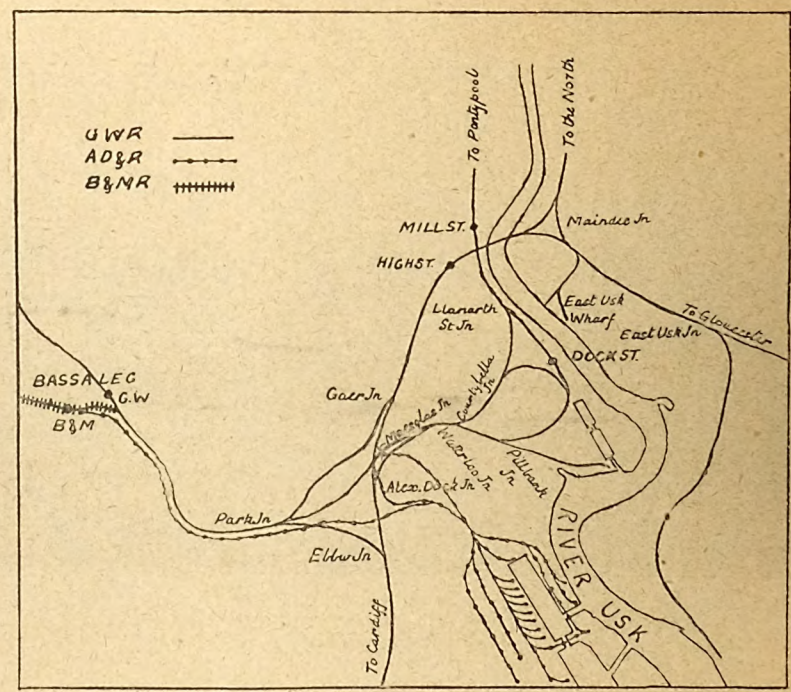
side the line from Park Junction to Ebbw Junction, the base being the main line. At the apex of the triangle (Park Junction) a line runs direct to Dock Street station. This line is used by mineral trains, and is the original route of the Monmouthshire Railway, which when constructed absorbed that part of the old Sirhowy Tramroad between Nine Mile Point and Newport. Actually, traffic for the Docks leaves this line at Maesglas Junction, from which point the metals of the Alexandra Docks and Railway are traversed. In addition to this junction the Alexandra Docks and Railway have a further connection with the Great Western Railway main line (Alexandra Dock Junction) which faces in the direction of Newport.

In the town of Newport a loop line extends from Courtybella Junction to Llanarth Street Junction, avoiding Dock Street station. This loop throws off another connection to near the last named station, but facing in the wrong direction for that depôt. Both these lines cross Commercial Street and Dock Street on the level. There is also a short branch from Pillbank Junction to the Town Dock. These numerous mineral lines form connection with the main line in the direction of Cardiff by means of a short spur from Waterloo Junction.

On the east side of the River Usk is a branch line to Messrs. Lysaght's works which leaves the main line at East Usk Junction, and some ¾ mile nearer Newport is a shorter branch to the East Usk wharf. Just before crossing the River Usk occurs the triangle junction at Maindee, which connects the original Pontypool, Caerleon and Newport Railway with the Great Western main line, and trains from Bristol, etc., to the north, *viâ* Severn Tunnel Junction travel over the east side of the Maindee triangle without entering Newport Station.



ENLARGED MAP SHOWING RAILWAYS IN THE VICINITY OF NEWPORT.

The Western Valleys line from Dock Street, already referred to, is continued through to Mill Street and up to Pontypool (Crane Street) and Blaenavon; and from Mill Street it forms the Eastern Valleys section of the old Monmouthshire Railway. South of Cwmbran Junction it is used for mineral traffic only, but at that point a short line from Llantarnam on the adjoining Pontypool, Caerleon and Newport section joins it. In the neighbourhood of Pontypool there are numerous junctions connecting these two lines, and also the cross country

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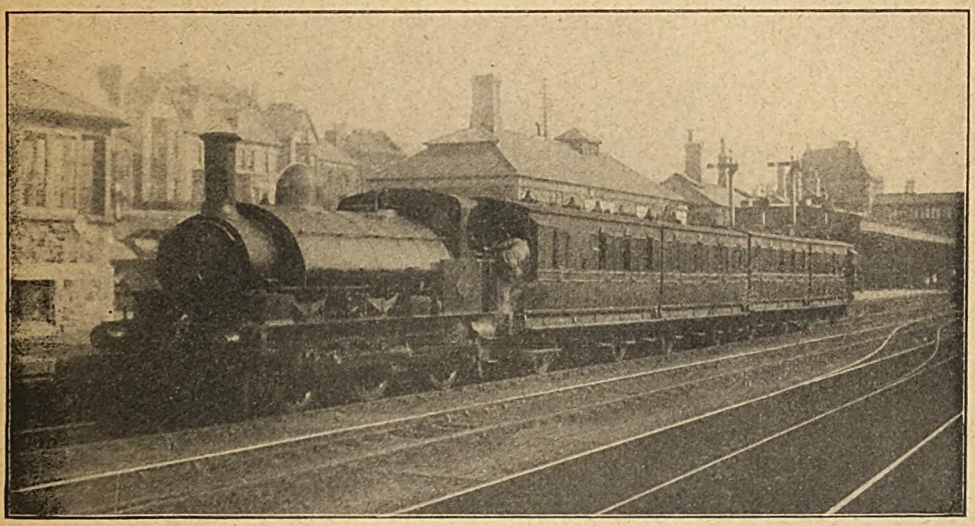
line to Neath. At Pontypool there are three stations, *viz.*, Pontypool Road on the main line to the North, Clarence Street on the line to Neath, and Crane Street on the Eastern Valleys section.

Newport is the largest town in a district which is exceedingly populous, and the station being the converging point of so many lines, it follows that the platforms are never free from crowds, and to witness the influx of passengers from every train on a Saturday, for instance, is a sight better seen than described. The principal "business" traffic is to and from Cardiff, 12 miles away; Bristol, perhaps, coming a good second in this respect. Although the towns in the valleys are thickly populated, the traffic cannot be termed a business one, as the majority of the population is employed locally and only travels on special occasions, such as Saturdays and market days. Between Newport and Cardiff,* 50 down and 48 up trains are run, the quickest times being 17 min. for the 12 miles in either direction. From Newport to Bristol there are 14 trains, and 15 in the opposite direction the quickest either way occupying 39 min. for the distance of 26½ miles.

The most important trains between London and Newport, *viâ* Badminton, number six each way. Whilst the majority of these make the run of 133½ miles without stop, some stop at one or two stations, the time occupied varying from 2½ to 2¾ hours. The best run is that made by the 8.45 a.m. down Fishguard express, which, with a 2 min. stop at Reading, is due Newport at 11.15 a.m., the running speed thus being practically 54 miles per hour. Most of the up trains are allowed a few minutes longer than the down trains.

The towns in the Eastern and Western Valleys are served with trains about every hour, with an augmented service on Saturdays. Between Newport and Merthyr a rail motor runs four times each way daily.



Photo] [*H. L. Hopwood.*

BRECON AND MERTHYR RAILWAY TRAIN AT NEWPORT.
0-6-0 Saddle tank engine No. 31.

A reference to the time-table does not reveal the route taken by these trains as in the table no stations are shown between Risca and Hengoed. Actually the trains run *viâ* the Western Valleys line to Nine Mile Point and then over the London and North Western Sirhowy branch. Just before Pontllanfraith is reached they turn off to the left and reach the Great Western line from Pontypool to Neath at Gellygroes Junction, along which they travel to Quaker's Yard, and from there they traverse the Quaker's Yard and Merthyr Joint (Great Western and Rhymney) line to Merthyr.

The train service between Newport and Pontypridd consists of four trains a day

* The train services mentioned in this article were those in operation previous to the outbreak of war.

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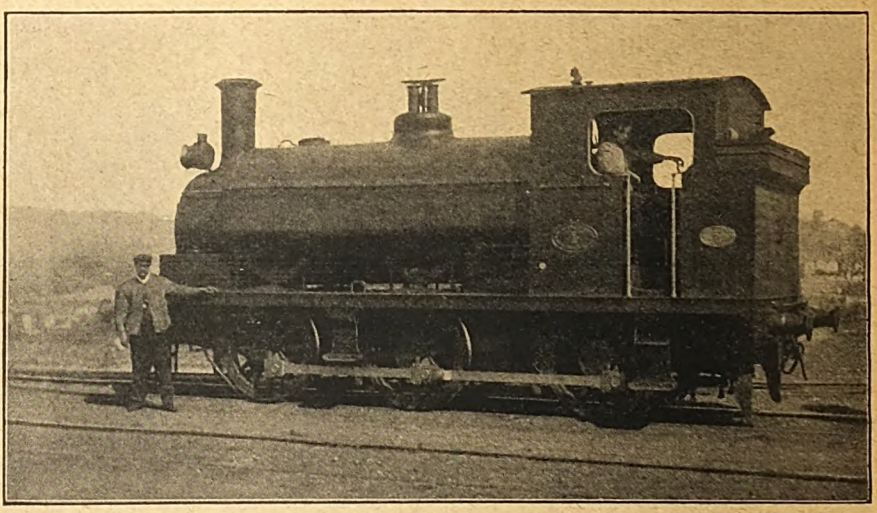
each way. These trains, as already mentioned, are worked by the Great Western Railway for the Alexandra Docks and Railway. A study of the working arrangements of the latter Company is interesting, if somewhat complicated. Briefly stated, the Pontypridd, Caerphilly and Newport Railway dates from 1884 and enjoyed an independent existence until 1897, when it was absorbed by the Alexandra Docks and Railway. The latter railway provided engines and carriages for the passenger trains from the date of opening in 1884 until the end of 1898, when the Great Western Railway undertook the working. The route taken by these passenger trains from Newport is over the Great Western Railway to Bassaleg South Junction, thence *viâ* the Brecon and Merthyr Railway to Caerphilly East Junction. From that point the Rhymney Railway is made use of through Caerphilly station and as far as Penrhos Junction. There the Pontypridd, Caerphilly and Newport territory proper is entered upon and continued over until just south of Pontypridd, where the Taff Vale Railway is joined. Thus, the original Pontypridd, Caerphilly and Newport Railway actually extended only from Pontypridd Junction to Caerphilly, and to reach Newport (High Street station) a distance of 18 miles 29 chains from Pontypridd, the lines of four foreign Companies, *i.e.*, the Taff Vale, Rhymney, Brecon and Merthyr, and Great Western Railways, were made use of.

For some years the Alexandra Docks and Railway occupied a rather curious position, for whilst from 1884 to 1898 it provided engines for the Pontypridd, Caerphilly and Newport passenger trains, its own mineral trains were worked by Taff Vale engines between Pontypridd and Newport until May, 1906, since when the Alexandra Docks and Railway have provided their own engines for this service. The present position of affairs may be summarised thus: the passenger service between Newport and Pontypridd has been worked by the Great Western Railway since 1899, whilst a supplementary service has been provided between Pontypridd and Caerphilly by the Alexandra Docks and Railway rail motors since 1904. The mineral traffic of the Alexandra Docks and Railway has been worked by their own engines between Pontypridd and Newport Docks since May, 1906.



Photo] [*H. L. Hopwood.*

ALEXANDRA (NEWPORT AND SOUTH WALES) DOCKS AND RAILWAY.
0-6-0 Saddle tank engine No. 1.

We have now referred to all the Great Western train services centreing on Newport, and in addition to these there are the trains of the London and North Western and the Brecon and Merthyr Railways, and also those of the Great Western Railway to and from Bristol and the North *viâ* Severn Tunnel Junction. The latter do not enter the station at Newport, but travel *viâ*

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Maindee Junction to their various destinations. Such trains as pass Maindee number eight going north and nine coming south.

The London and North Western Railway provide nine trains between Newport and Tredegar or Nantybwch, and eight in the opposite direction. The point of junction between the London and North Western and Great Western Railways is immediately east of Nine Mile Point station.

The Brecon and Merthyr Railway train service as affecting Newport consists of nine trains each way (ten on Saturdays), four of which are to or from Brecon and the remainder to or from Rhymney. The Brecon and Merthyr Railway exercises running powers over the Great Western Railway between Newport and Bassaleg South Junction, and at Bassaleg the former company has a station separate from that of the Great Western Railway.

The following table gives the number of daily passenger trains dealt with at Newport High Street station :—

Section of Line.	Down Trains	Up Trains
Main Line, Severn Tunnel Junction and Cardiff	53	55
Eastern Valleys	15	15
Western Valleys	15	15
Newport, Pontypool Road and North	16	16
Newport and Merthyr	4	4
Pontypridd, Caerphilly and Newport	4	4
London and North Western Railway	9	8
Brecon and Merthyr Railway ..	9	9
Total	125	126
Grand Total, up and down trains ..	251	

On Saturdays there are 141 down and 142 up trains, or a total of 283. As to the goods and mineral trains in the Newport district, figures of these are omitted because many of such trains run as specials and their number varies from day to day according to the fluctuations of traffic, but it may be said that, particularly over the branch lines, the goods and mineral trains far outnumber the passenger trains. Only a small proportion of the total number of freight trains pass through High Street station, the majority being dealt with at the Docks, or at the Dock Street or Mill Street depôts.

The type of engine used principally on the branch line trains—both passenger and goods—is the 0–6–0 saddle tank, of which the Great Western Railway possesses over 1,000. The more modern 2–6–2 and 2–8–0 side tanks are also to be seen in great numbers on coal trains, and No. 115, the first of the 2–6–2 4 ft. wheeled class has been stationed at Newport since it was new in 1904. Two classes not seen very often in the district to-day, but fairly common in the past, are the 0–4–2 and 2–4–0 side tanks. Of the former we illustrate, on page 435, No. 845 standing in Newport station. The Brecon and Merthyr Railway have several interesting types of tank engines, most of which are to be seen daily at Newport. The London and North Western Railway employ exclusively for passenger trains the 4 ft. 3 in. 0–6–2 side tanks which are stationed at Tredegar. The most recent main line engines of the Alexandra Docks and Railway are large 0–6–2 saddle tanks with outside cylinders.

Space has not permitted of our dealing at any length with the early history of the local railways. Much might be written, for instance, about the old Monmouthshire tramroads—but it may be said in conclusion that the district of Newport—and also that of South Wales generally—is rich in railway history, and the many miles of lines contained in the area offer a fine field of investigation to the railway student, whatever branch of the subject he may choose.

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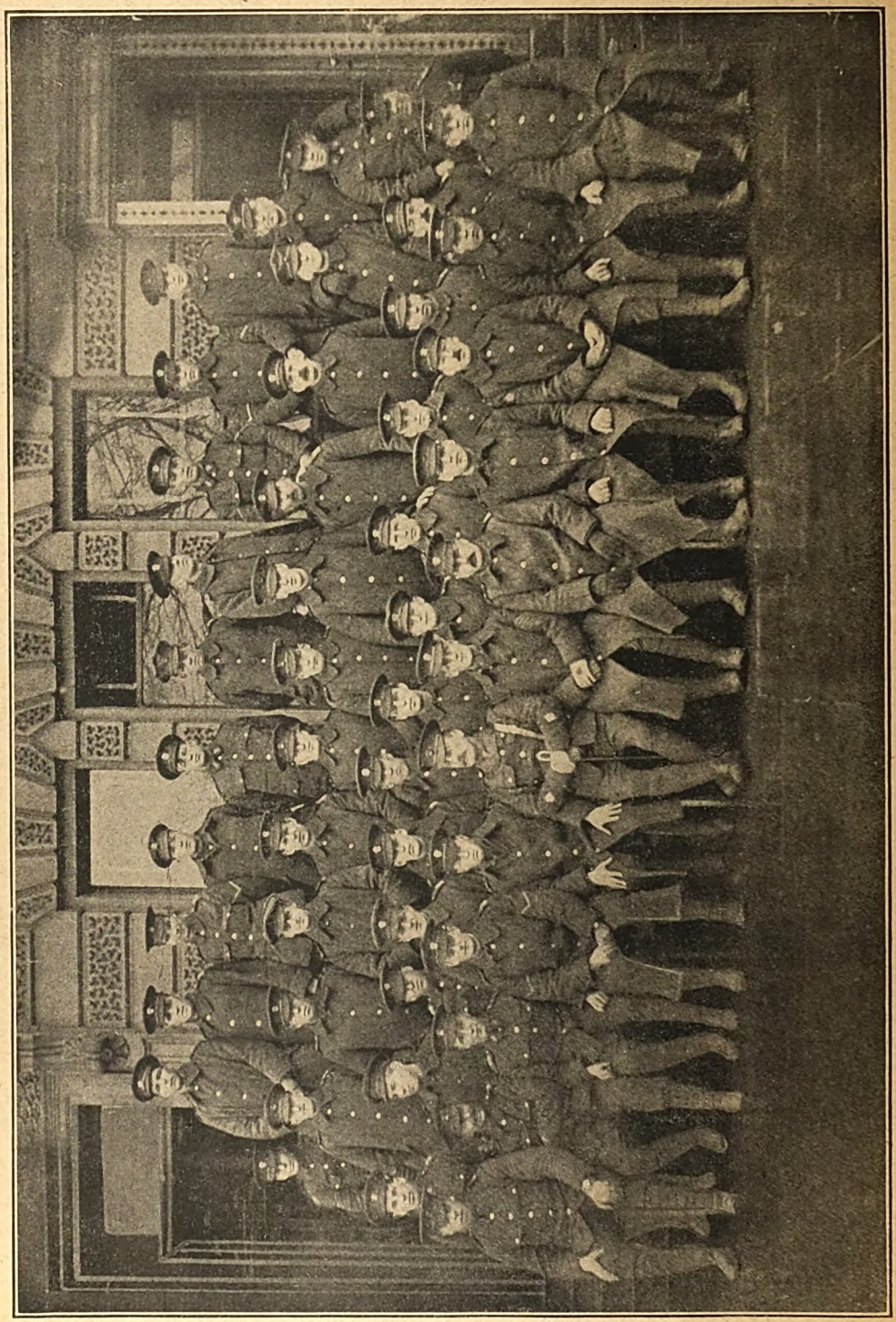

A DRAFT OF NORTH EASTERN RAILWAY PIONEERS.
(By courtesy of the "North Eastern Railway Magazine.")

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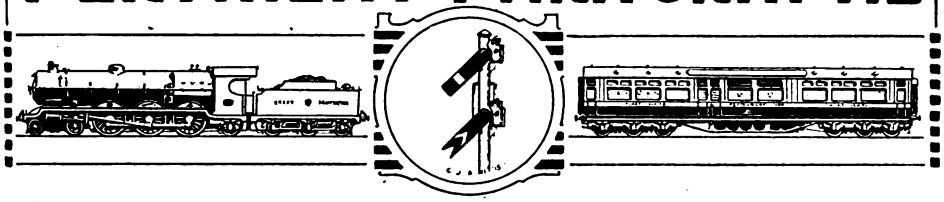
PERTINENT PARAGRAPHS



Discontinuance of Restaurant Cars.

RELATIVELY early in April, but yet too late for reference in our last issue, the London and North Western Railway announced that all breakfast, luncheon, tea, and dining-cars would be discontinued as from May 1st. That this step was threatened was known some time before, but it was not until almost the end of April that any other railway indicated their intentions in this respect. The Great Western Railway then announced that commencing May 1st restaurant cars would be withdrawn from the following trains: Week-days—11.0 a.m., Paddington to Birkenhead; 1.40 p.m., Paddington to Hereford; 4.55 p.m., Paddington to Oxford; 6.0 p.m., Paddington to Wolverhampton; 7.30 p.m., Paddington to Wolverhampton; 6.50 a.m., Wolverhampton to Paddington; 9.5 a.m., Birkenhead to Paddington; 12.50 p.m., Hereford to Paddington; 11.47 a.m., Birkenhead to Paddington; 7.37 p.m., Oxford to Paddington; 12.30 p.m., Plymouth to Liverpool; 12.40 p.m., Bristol to Liverpool; 9.10 a.m., Liverpool to Plymouth; 10.30 a.m., Liverpool to Bristol. Sundays—10.20 a.m., Paddington to Worcester: 11 10 a.m., Paddington to Shrewsbury; 3.15 p.m., Birkenhead to Paddington; 6.0 p.m., Worcester to Paddington.

These withdrawals cover all services which in any way serve similar routes to those of the London and North Western Railway. Other announcements followed, to the effect that all East Coast Anglo-Scottish services would cease to include restaurant cars. This affected also the North Eastern and North British Railway, but both of these railways have so far retained such services as remain entirely within their own supervision. Thus the North Eastern statement was to the effect that "commencing May 1st, the whole of the dining restaurant cars on its system (including those on the East Coast trains between King's Cross and Scotland) will be discontinued, except on the 8.55 a.m. Leeds to Glasgow; the 5 p.m. Glasgow (6.25 p.m. from Edinburgh) to Leeds; and the 12.40 p.m. York to Newcastle. The breakfast car on the 8.0 a.m. from Newcastle will not run beyond York. A tea and dining car will be attached to the 4.50 p.m. Newcastle to York, and will be transferred to the 6.34 p.m. York to Doncaster. A dining and supper car will be attached at Doncaster to the 5.30 p.m. from King's Cross to Newcastle, which will be due to leave Doncaster at 8.30 p.m."

On its own system the Great Northern Railway has withdrawn all its own cars as well as those of the joint services. In the public announcements passengers are advised to take into account possible difficulties in obtaining refreshments, though as far as practicable all demands for luncheon and tea baskets will be met.

Scottish Railway Arrangements.

SIMILARLY the North British Railway announced that "the dining and restaurant cars on all the East Coast trains between Edinburgh (Waverley) and London (King's Cross) will be discontinued as from May 1st, but the dining and restaurant cars at present run on the North British local trains will be continued."

As the corollary to the withdrawal of restaurant cars on the London and North Western Railway, the Caledonian Railway have withdrawn all dining and restaurant cars on the through trains between Scotland and England by the West Coast route. Pending further arrangements, a Pullman dining car is being run on the following services: 6.40 a.m. Aberdeen to Perth; 12.20 p.m. Perth to London (Euston) —as far as Symington; 10 a.m. from London (Euston)—(3.55 p.m. from Carlisle)—from Symington to Perth and Aberdeen. The Pullman dining and restaurant car services between Glasgow (Central) and Edinburgh (Princes Street) and between Glasgow (Buchanan Street), Perth, and Aberdeen will also meantime be continued. Passengers are advised that luncheon baskets may be obtained from the train attendants on the 10 a.m. Glasgow (Central) to London (Euston); 2 p.m. Glasgow (Central) to Liverpool, Manchester, and London (Euston); 4.30 p.m. Glasgow (Central) to Liverpool and Manchester; 10 a.m. and 2 p.m. London (Euston) to Edinburgh (Princes Street), Glasgow (Central), and the North; 12.35 p.m. Manchester (Victoria) to Edinburgh (Princes Street) and Glasgow (Central). Passengers may obtain luncheon baskets at the respective starting points or at Carlisle or Preston by the following trains: 2 p.m. Edinburgh (Princes Street) to Liverpool, Manchester, and London (Euston); 10.10 a.m. Glasgow (Central) to Liverpool and Manchester; 5.50 p.m. Liverpool (Exchange) and 5.45 p.m. from Manchester (Exchange) to Ednburgh (Princes Street), Glasgow (Central), and the North.

Until the time of writing the Midland Railway has taken no move in this direction, while a few other services which can be said to provide "competitive facilities" in this respect still remain.

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Traffic Value of the Restaurant Car.

THE withdrawal of these cars is to be regretted, but it is recognised that it is a war measure. The present generation has grown up with these conveniences available on all important long-distance trains, and frequently for shorter journeys also; but the value of the restaurant car goes much beyond the conveniences of travel considered alone. It has, in fact, constituted a main factor in rendering long journeys acceptable from the tourist and pleasure aspects; but it has done still more in developing extended and frequent journeys as a standard business practice, and the withdrawal will inconvenience business men, engineers, inspectors of munitions, and others engaged in national service, together with Army officers, probably more than the general public. The restaurant car enables virtually the whole day to be devoted to business, and travelling time, otherwise wasted, is utilised in ministering to physical needs. That luncheon and tea baskets will be available is only a partial remedy; but there will be plenty of accommodation for serving refreshments to trains, so that this inconvenience will not be a vital one, and will no doubt be accepted as readily as other deprivations which have arisen by reason of the war.

Reasons for this Action.

NEEDLESS to say this step is only being taken for good and sufficient reasons, and these may be briefly set forth. Returns for 1915 show that there is a total of 543 restaurant cars in service on British railways. The staffs involved, therefore, amount to a considerable number, and in addition are those employed in the restaurant car depôts, by no means inconsiderable figures. Possibly half of these could be replaced by women, but not all by a long way, and in the aggregate it may be said that, at a very low estimate, over 1,000 men could be released for war service, while the remaining men will be otherwise available to replace younger men engaged on other duties. The London and North Western Railway has the largest total of restaurant cars (105).

Taking the companies so far concerned, and dealing with totals, the numbers of restaurant cars are: London and North Western Railway, 105; Caledonian Railway, 14; Great Northern Railway, 63; Great Western Railway, 56; North Eastern Railway, 30; North British Railway, 20; total 288, out of the 543 constituting the grand total, though not all are yet out of service. As these figures are based upon proportionate totals where jointly-owned vehicles are concerned, the aggregate result is substantially the actual number of vehicles. But apart from the men thus released there is the important consideration that these cars are usually heavy vehicles. Being special stock they require to be kept to specific services, repairs of special vehicles are always more serious than those of standard coaches, and with so great a shortage of repair staffs these considerations will no doubt count for a great deal. Furthermore, many restaurant cars are run additional to the seating accommodation of the train, and where this is not the case the weight per passenger is usually considerably in excess of that provided in ordinary carriages. Consequently the weight of trains can be relieved, a better economic relation between number of passengers and weight hauled realised, and there will be greater freedom of usage of stock, all factors of special importance in view of the increasingly difficult problems of maintenance and efficient employment of stock which the railway officials now have to face. The removal of restaurant cars also enables trains to be combined, or the use of assisting engines dispensed with, while easing the loads of trains reacts in favour of the locomotives and their maintenance.

Expresses Combined.

As was anticipated, a number of alterations in the running of trains on routes where restaurant cars have been unknown are being made. The taking off of this heavy rolling stock enables the companies to conserve engine power, and to reduce train mileage, so that in many instances trains can be combined. This is being done in a number of instances where two heavy trains were run close together, indicating that the withdrawal of restaurant cars may make very appreciable difference in the weight of trains. Thus, on the Great Northern Railway the 1.40 p.m. is combined with the 1.30 p.m. train and the 5.45 p.m. with the 5.30 p.m. On the London and North Western Railway the 10.35 a.m. is combined with the 10.25 a.m., the 6.5 p.m. with the 5.55 p.m., the 8.40 a.m. from Birmingham with the 8.45 a.m., and so on. No doubt more of this will be done in due course, in conjunction with the insertion of additional stops to enable one train to replace another combined with it.

Other Facilities Withdrawn.

FOR some time the withdrawal of "luggage in advance" and "carted luggage" facilities has been threatened, and at periods, and on certain lines, these facilities have not been generally available. Indeed, it is only the fact that passengers have so far responded as to keep personal luggage within bounds, and largely restricted to what they can carry with them, that has allowed this facility to be kept as long as it has. The London and North Western Railway withdrew these facilities as from April 17th, and it may be confidently predicted that during the summer months any general attempt to utilise these facilities as in pre-war days will be severely discountenanced. There is enough difficulty in dealing with the goods cartage work as it is, without this traffic, much of which is more of a convenience than an actual necessity.

The withdrawal of tourist tickets on certain lines is somewhat inexplicable, except on the principle that the extensive "break of journey" and special alternative route facilities associated

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therewith complicate the work of ticket examination and checking, whereas ordinary tickets must be used more or less according to the journey covered and with regard to only limited alternative route facilities. In the matter of cost the gain was only slight as compared with ordinary fares.

Daylight Saving.

An important development in connection with the economy of fuel is the revival of the proposal for advancing the time by one hour during the summer months. Sir Henry Norman's resolution presented to Parliament read as follows: "That, in view especially of the economy in fuel and its transport that would be effected by shortening the hours of artificial lighting, this House would welcome a measure for the advancement of clock time by one hour during the summer months of this year." The Home Secretary addressed to Sir Henry Norman a letter, in the course of which he said: "The Government cannot be indifferent to the fact that the advancement of clock time by one hour throughout the country during the summer months will lessen by an hour a day the time of artificial lighting, with a consequent large saving in the expenditure on fuel for lighting purposes." In regard to railway interests, the only apparent difficulty would arise in connection with the Continental services, and this has been obviated by the practical adoption of the policy by the French Government, though this was considered a serious drawback when "Daylight Saving" was advocated by the late Mr. Willett in 1908. The Bill, which has since received Royal assent, provides that for this year the prescribed period shall be from 2 o'clock in the morning Greenwich mean time on Sunday, the 21st day of May, until 2 o'clock in the morning Greenwich mean time, on Sunday, the 1st day of October.

Railway Views.

The fact that the Railway Executive Committee has expressed an opinion in favour of the change is of interest, but it is not a new attitude of the railway companies. In 1908, when the Daylight Saving Bill was before Parliament, several companies supported its principle and sent witnesses to give evidence before the Select Committee to which the Bill had been referred. The Bill then provided for putting forward the clock twenty minutes on four successive Sundays in April, and for reversing the process on the four Sundays in September. Mr. J. F. S. Gooday (then General Manager, Great Eastern Railway) gave evidence in support of the principle, and Mr. J. H. Vickery (then London and South Western Railway), Sir R. Turnbull (London and North Western Railway), and Sir Sam Fay (Great Central Railway) supported the Bill.

From our own point of view the proposal may be cordially commended. To be practicable there must be systematic action, and that can only be attained as a result of legislation; but once the change is made there would be no inconvenience. To cover train working during the nights of change special railway instructions will be necessary, but such action is often required, as when a new time-table comes into force. Some adjustment will, of course, be necessary to cover the movements of trains travelling during the period of change, and hours of duty will have to be arranged; but the early hours of a Sunday morning certainly provide the most favourable opportunity.

Closing of Great Eastern Railway Stations.

It was not until April 29th that any intimation was given that the closing of Great Eastern Railway stations announced for May 1st, would not be carried out, despite the numerous and influential protests made in many quarters; but on the date mentioned the posters were crossed with slips stating that the change would be postponed until May 22nd. New time-tables had been prepared, but were not issued.

On Friday, May 12th, a new announcement was made, that on and from May 22nd, the following stations would be entirely closed: Barkingside, Cambridge Heath, Chigwell Lane, Coborn Road, Earsham, Geldeston, Globe Road, Leman Street, London Fields, and Shadwell. For passenger traffic, Bishopsgate, Malden West, Norwich (Victoria) and Trowse to be closed. This list is slightly modified from that originally announced, but in the London area, notwithstanding the various meetings of protest and other objections raised, Bethnal Green is the only station concerning which a change is indicated. Of country stations Bradfield, Buckenham, Stanhoe, Mardock, and West Mill are apparently being kept open; but Norwich (Victoria) is added to the list of closed stations, all ordinary passenger traffic being dealt with at Thorpe station.

It has to be borne in mind that it was never argued that there would not be considerable inconvenience, or that the numbers of passengers affected were negligible. Rather, the choice of stations was based upon the extent to which other means of conveyance were available, and the necessities of the situation created by the war. Several deputations were received by Mr. May, Chief Traffic Manager, questions were asked in Parliament, and meetings convened in the districts affected. It was stated that several thousand passengers daily use certain of the London suburban stations concerned, and that to throw these on to the tramcars and the Whitechapel and Bow Railway would entail a degree of overcrowding and inconvenience for which there would not be adequate justification. All this is admitted, though it may be pointed out that it is only the penny fare between Coborn Road and Liverpool Street, to meet tramway competition, which has retained a large proportion of such traffic as there is. In our view, from knowledge of the traffic on these sections it is the convenience of regular travellers between outer suburban routes and these stations which merits most consideration, passengers of this class being relatively numerous.

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It has to be remembered that unless action of this kind is taken it is difficult to see how the railway can release men for national service, and at the same time satisfy all objections of this class, especially as the closing of a few country stations or of isolated London stations can hardly produce results of very great value as regards freeing men for the Army or for use in replacement of others thereby released in numbers at all considerable.

Ambulance Train Exhibition at Broad Street.

An exhibition took place at Broad Street station (North London Railway), platform No. 9, on Friday, May 5th, between 8 a.m. and 7 p.m., of vehicles of one of the new ambulance trains constructed by the London and North Western Railway to the order of the War Office for service on the Continent. A charge of 1s. was made to each person viewing the train, the money being given to the fund for providing comforts for the Railway Troops (Royal Engineers) serving with the Expeditionary Force. This further exhibition of one of these trains is a tribute to the keen interest which is taken in all that contributes to the welfare of our soldiers. By this time not far short of half a million people must have inspected one or other of the trains which have thus been shown. Naturally, the highest numbers apply where the most extended exhibition programmes were adopted, and we understand that during the month that the Caledonian train was shown no fewer than 260,000 people inspected it. The somewhat less ambitious programmes adopted in the case of the Great Eastern and Lancashire and Yorkshire trains probably accounted for at least 50,000 visitors each; while the exhibitions at various dates of London and North Western, Great Western Railway, and London, Brighton and South Coast Railway trains realised further large numbers. In the aggregate the funds for the benefit of Railway Troops and for various Red Cross and other agencies have certainly benefited in a very large degree.

WARD CAR INCLUDED IN AMBULANCE TRAIN EQUIPPED BY THE LONDON AND NORTH WESTERN RAILWAY AND EXHIBITED AT BROAD STREET (NORTH LONDON RAILWAY).

Women as Carriage and Engine Cleaners, Goods Porters, etc.

Women having invaded most of the more obvious sections of railway employment, they are now being used also for the duties noted. In the carriage cleaning department staff shortage has been somewhat compensated for by the employment of women, as there are many places where this work is performed in which it can be carried out without great risk from moving vehicles, and at a time when there is such a paucity of labour the results obtained have quite justified their employment. Following on this experiment, some companies have resorted to the expedient of introducing female labour into the locomotive sheds for the purpose of assisting in the cleaning of engines. "Slops," such as those used by men, are largely worn for these duties. Women are now employed at the South Eastern and Chatham Railway goods depôt at Bricklayers' Arms, London. They perform exactly the same duties as the men whose places they have taken—act as weigh-bridge attendants, unload and load trucks and vans, help to deal with vast quantities of army supplies, check in the parcels, do the portering, move goods from one part of the station to another, van washing, etc. About 100 women are thus employed.

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Easter Holiday Traffic.

NOTWITHSTANDING the absence of cheap facilities, most railways had to prepare elaborate schemes for working traffic, and at most of the big railway termini the familiar "Special Easter Arrangements" were set forth by means of posters more or less as usual. The mere fact that the ordinary conduct of national and private business entails so much stress and anxiety ensured that there would be a considerable volume of travel over Easter in order to obtain a brief rest. Consequently posters were exhibited in all large stations giving particulars of relief, duplicated, and additional trains, much on the same lines as in pre-war days; while on the public Bank Holidays special train services were largely advertised, particularly where distances were not great, so that the payment of ordinary fares did not represent a serious increase upon the excursion rates of two years ago.

London and North Western Railway (London) Amateur Operatic and Dramatic Society.

ON Friday and Saturday, May 5th and 6th, and on Saturday, May 13th, the Amateur Operatic and Dramatic Society associated with the London and North Western Railway (London) Athletic Club, rendered Planquette's famous comic opera, "Les Cloches de Corneville," at the King's Hall, Covent Garden, W.C., profits being devoted to the British Red Cross Society and the *London and North Western Railway Gazette* Comforts Fund for London and North Western Railway Wounded Soldiers. This was the third performance of the Society, and the first performance of this opera with the choruses fully arranged by Mr. David J. Thomas. In the third act a Gavotte was introduced (a double encore was insisted upon for this on the occasion of our visit), for which the dance music from "Mignon" (Ambroise Thomas) was played, four of the ladies taking the parts of gentlemen, and all being dressed in the style of the period when this graceful dance was in greatest favour. The opera was produced under the stage direction of Mr. Arthur C. Chapman, and the musical direction of Mr. David J. Thomas. Leading characters were taken by the following ladies and gentlemen, the latter being all in the employ of the London and North Western Railway, and the former associated with the staff of the Company: *Serpolette*, Mrs. W. J. Manclark; *Germaine*, Miss Marjorie Fraser; *The Marquis de Corneville*, Mr. F. Parkinson; *Gaspard (a miser, Steward to the the Corneville Estate)*, Mr. Arthur C. Chapman; *The Bailie of Corneville*, Mr. T. H. Green; *Grenicheux*, Mr. N. A. Merriman; *Gobo (the Bailie's shadow)*, Mr. P. Wetherell; *Christopher*, Miss Marjorie L. Groves. The orchestra was provided by the Central London Orchestral Society. The performances were supported by full houses, and it is largely due to the energetic work by the hon. acting manager, Mr. D. H. F. Meacock, and the hon. secretary to the Society, Mr. Charles E. A. Howard, that so satisfactory results were realised. Acknowledgment is also necessary of the work of the stewards, and of ladies who sold programmes. The Amateur Dramatic and Operatic Society and kindred agencies of the London and North Western Railway have earned a high reputation in regard to the consideration paid to wounded soldiers, and on this occasion a large number were included in the audience. The Committee desire to record their thanks to all their patrons, especially to those who so liberally subscribed to the Soldiers' Entertainment Fund, and the owners who so kindly placed their motor cars at the Society's disposal for conveying wounded soldiers. A detachment of St. John Ambulance men assisted the wounded soldiers, while after the performance the soldier guests were entertained to a substantial tea. To welcome these wounded heroes, Sir Gilbert Claughton addressed a few words, reproduced in facsimile on the special programmes provided for the soldiers.

Railways and the Irish Rebellion.

RAILWAYS were affected in various ways as a result of the Irish rebellion, and apart from dislocation and delay to traffic due directly and indirectly thereto they suffered in several respects. Westland Row station, the terminus of the Dublin and South Eastern Railway, and commanding the Kingstown route, was seized early in the campaign; also Broadstone station, the terminus of the Midland Great Western Railway; besides various business premises and the General Post Office. They failed to hold Westland Row station against the troops. During the few hours before the arrival of the troops from the Curragh a party of rebels damaged a bridge on the Great Northern Railway just outside Dublin, and so cut communications by the route with Belfast. Another party attempted to blow up a bridge on the Midland Great Western line, but succeeded in destroying only one line, so that communication was still possible by this route. Preparations were made at Ball's Bridge, on the south-east of the city, to intercept troops coming from England. The force here, however, was small and was overcome without much difficulty.

One of the first intimations of trouble was the pulling down of telegraph poles on the Great Southern and Western Railway during the previous week, a train being derailed, and officers who went to investigate being fired upon. It is stated that on one of the rebels was found a book entitled "The Simple and Efficient Demolition of Railways." As soon as the rebellion was fully in hand, train services were gradually restored, but the police examined prospective passengers at the stations. Events in Ireland influenced traffic in England and Scotland, but in due course the ports of Dublin, Kingstown, Belfast, Greenore and Larne were re-opened, though for the time being military passes were necessary.

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Secretarial Department, Midland Railway.

THE Directors of the Midland Railway have appointed Mr. W. N. Bancroft to be Secretary to the Company, in succession to Mr. Alexis L. Charles, who has retired after over half a century of service. Mr. Bancroft joined the staff of the secretary's office in 1877, under the late Mr. James Williams, and has been Assistant Secretary since 1904.

Mr. Charles, who succeeded Mr. Williams as Secretary of the Midland Railway in June, 1899, commenced his railway career in the Accountant's Department in September, 1865, and in December, 1866, was transferred to the Secretary's Department. He became principal assistant to the Secretary in January, 1883, and was appointed Assistant Secretary in July, 1891, attaining the supreme position eight years later. Mr. Charles was elected on the Council of the Chartered Institute of Secretaries in July, 1899, was Vice-President 1903–1905, and President 1905–6. He is a member of the Committee of the Railway Benevolent Institution, a representative of that Institution on the Committee of the Railway Servants' Orphanage, and was for a number of years Chairman of the Railway Servants' Orphanage Concert Committee. Mr. Charles was created a Justice of the Peace for Derby Borough in 1904, and a County Magistrate in the following year.

Accountant's Department. Great Western Railway.

MR. RALPH COPE has been appointed principal assistant to the Chief Accountant of the Great Western Railway, on the resignation of Mr. Edward Wells, Joint Chief Accountant. Mr. Cope was born in September, 1862, and entered the Company's service as a lad clerk in the Chief Accountant's office in January, 1877. At stages of his career he became, successively, head of the funds department, head of the paybills department, supervisory chief of the paybills, staff, and cash audit sections, head of the joint department, and in 1910 was appointed chief clerk. In 1912 he received an expression of appreciation by the Board of Directors for valuable services rendered in connection with the reorganisation of the hotels and refreshment rooms department's accounts.

Mr. Edward Wells, who has resigned the position of Joint Chief Accountant, Great Western Railway, was formerly a member of the firm of Messrs. Gane, Jackton, Jeffreys, Wells & Co., chartered accountants, Coleman Street, London, E.C. He was appointed Joint Chief Accountant to the Great Western Railway in association with Mr. G. J. Whitelaw during 1913. Born in 1862, Mr. Wells began business training in 1878. In 1884 he entered the office of the above-mentioned firm. In 1896 he became a partner. Admitted a fellow of the Institute of Chartered Accountants in 1901, he went in the following year to Brazil to reorganise the accounts of the Great Western Railway of Brazil, which had just then linked up with its own a number of lines leased from the Brazilian Government. At the beginning of 1913 he went again to Brazil, reorganising railway accounts and undertaking other enterprises. On his return he received his late appointment at Paddington.

Mr. Harold R. Prideaux, who has been a member of the Chief Accountant's staff for thirty years, succeeds Mr. Cope as chief clerk. He was born on January 1st, 1870, and entered the accountant's office at the age of sixteen. He has had varied experience in the department, and at successive periods was in charge of the departmental accounts, joint accounts, and capital accounts departments respectively.

A "Bantam" Railway.

THE Eskdale Railway in Cumberland, the reconstruction of which as a miniature railway was described last December, was brought into use as far as Eskdale Green, 4¾ miles from Ravenglass, on March 27th last, and it is hoped that the next section as far as Beckfoot, 6½ miles, will be ready for use early in June. A lavish train service is provided, consisting of seven down and six up passenger trains each weekday, with five trains in each direction on Sundays, all arranged to connect conveniently with the Furness Railway trains at Ravenglass. The time allowed for the journey, including regular stops at Muncaster and Irton Road, and conditional stops at Miteside and Murthwaite, is 30 min., the average running speed being about 12 miles per hour. Coal and general merchandise are also conveyed by the railway, the wagons being attached to passenger trains when the loads of the latter are moderate, or being made up into special goods trains when necessary.

For the working of the latter the 0–4–0 tank engine *Katie* has been purchased from the Duke of Westminster's railway at Eaton Hall. This locomotive, although not capable of the same speed as the miniature express engines, is a powerful machine for this gauge, having a capacity for 28 tons on the level, and 6½ tons up a grade of 1 in 25. She has cylinders 4⅝ in. diameter by 7 in. stroke, driving wheels 15 in. diameter, heating surface 53 sq. ft., working pressure 160 lbs. per sq. in., and weighs in working order 3¼ tons. There is also the miniature 4–4–2 engine described last December, and in addition the famous 4–6–2 express locomotive *John Anthony*, of the Staughton Manor Railway, has been added to the Eskdale "stud," and is renamed *Colossus*. At the same time the passenger rolling stock has been increased by the addition of a covered compartment coach, increasing the covered seating accommodation to 24 seats, which is the maximum required under ordinary working conditions.

A heavy Easter traffic was conveyed, all three engines being in steam on several days. From the Friday to the Tuesday some 500

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single journeys in all were made, a number far exceeding the maximum that was dealt with at any time by the old company. Visitors came from all parts to inspect the line, and the "rush" of passengers after the arrival of the Furness Company's morning trains at Ravenglass was such that several of the down Eskdale trains had to be run in duplicate. At other busy times the "Atlantic" engine *Sanspareil* was used to pilot the "Pacific" *Colossus*, the two forming a handsome and powerful combination which easily kept time with trainloads of from 70 to 80 passengers, despite the formidable gradients of the line. The weather being exceptionally fine on all days but Easter Monday, the open cars were used on all journeys.

local passenger trains on the Coventry-Leamington-Rugby loop line, when I was living at Leamington during the years 1876-78. I see no reference made to them in the above article, and am curious as to their origin and history. They were 6-wheeled saddle-tank engines, having inside cylinders and single drivers of small diameter (certainly not more than 5 ft. 6 in.), and no names. They had double frames with outside springs and axle-boxes, and no cab. In general design they presented a somewhat 'huddled up' and clumsy appearance. I have an idea that they may have been conversions of one of Trevithick's designs, and, of course, they have long since disappeared."

4-6-2 ENGINE *Colossus* ON TRAIN, ESKDALE RAILWAY (15 IN. GAUGE).

"Information Required."

"H. G. C." raises an interesting query concerning London and North Western Railway train working in 1876-8. Possibly some of our readers can supply the desired information. He writes: "I have been interested by the perusal of an article on 'Locomotive and Train Working during the Latter Part of the 19th Century—London and North Western Railway—[No. III.], by Mr. E. L. Ahrons, which appeared in your issue of March, 1915. I wonder whether any of your readers could give me any information regarding some small London and North Western engines which used to work the light

0-4-2 Tank Engines on the Great Western Railway.

A PORTSMOUTH reader, Mr. E. J. Dorey, writes as follows: "In connection with Mr. Ahrons' interesting articles and Mr. Hewitt's letter referring to the Great Western Railway 0-4-2 tanks which were converted to 4-4-0 tender engines, you may be interested to know that the 9 a.m. train from Southampton to Portsmouth, which arrives about 10.15 a.m., has been worked over the South Western line to Portsmouth for about two years by engines of this class. No. 3525, with coned boiler, worked it for a long time, relieved when necessary by No. 3545,

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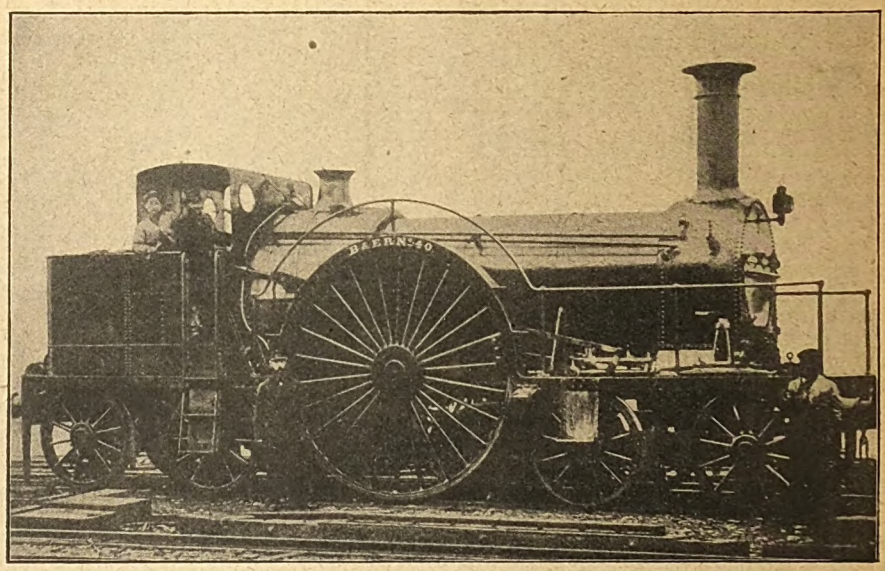
which has a domed boiler. For some time past it has been taken by No. 3540, which has a coned boiler, relieved occasionally by Nos. 3543 or 3549, which have domed boilers. No. 3549 also has the top feed, between the dome and the smokebox. I have only seen any other class of engine on this train on one occasion, when it was hauled by No. 3221, a 2-4-0. They return on the train leaving Portsmouth Harbour at 12.15 midday, which often consists of nine or ten 8-wheeled South Western coaches. Their small wheels enable them to make a good start on the sharp up grade out of the station, and they get away very quickly."

"One of the most interesting trains from a locomotive point of view which works into Portsmouth is the one arriving from Brighton about 9 a.m., on which I have seen almost every class of engine possessed by the Brighton Company. As an example, in five days recently it was hauled by Nos. 599 (4-4-2 T), 25 (4-4-2 T), 200 (0-4-2), 211 (4-4-0), and 38 (4-4-2). By contrast, the train arriving at 10.40 a.m. from Brighton has been hauled for months past, Fridays excepted, by No. 381, a 0-4-4 T."



4-2-4 9 FT. SINGLE TANK ENGINE: BRISTOL AND EXETER RAILWAY (*as originally built*).

In view of the interest attaching to the old 9 ft. single tank engines of the Bristol and Exeter Railway, the above photograph, for which we are indebted to Mr. J. Robson of Cardiff, may fittingly be reproduced as showing one of these engines in its original condition.

Standard Gauge Locomotives: Great Western Railway.

"If my own observations (made in my schoolboy days, but still retained) are correct," writes Mr. L. B. Hewitt, of Bath, "Mr. E. L. Ahrons makes one error in his notes in the April number of Railway Magazine on the naming of the 'Sir Alexander' class of Great Western 7 ft. singles. According to my memoranda, No. 1119 was named *Princess of Wales*—not *Prince of Wales*. The latter title was allotted to No. 1132, of the same class. In recent years the Great Western Railway has followed pretty consistently the practice of transferring time-honoured names from one class of locomotive to another, or even from one engine to another of the same class. If space allowed, I could cite many illustrations of this. A few bearing on the names mentioned in Mr. Ahrons' articles will suffice. *Gooch* was adopted for No. 8, one of the four 4-4-0 engines with 7 ft. driving wheels built in the 'nineties, and still running in a modernised form. *Duke of York* and *Princess May* were selected as the respective titles of Nos. 3063 and 3077, two of the last batch of twenty 7 ft. 8 in. 4-2-2 engines, which numbered 80 in all, and have now disappeared in their turn. The other names borne by this class were not perpetuated for later engines. No. 3062 of the 4-2-2 type was named *Albert Edward* in compliment to the then Prince of Wales. At the Diamond Jubilee of 1897, No. 3041, *Emlyn*, of this class, was re-named *The Queen*, and employed to haul the Royal train from Windsor to Paddington and back. It was understood at the time that the 'definite article' was expressly introduced in No. 3041's title to distinguish her from No. 55, the old 7 ft. single. To-day the members of the reigning dynasty are commemorated in the names assigned to various

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4-6-0 four-cylinder engines. Thus *King Edward* is No. 4021, *King George* No. 4023, his consort, *Queen Mary*, No. 4031, *Queen Victoria* 4033, and *Prince of Wales* No. 4041. It is strange how it 'puts back the clock' to see the illustrations of these famous old racers of 20 years and more ago in the current number of your interesting periodical."

Glasgow and South Western Locomotives.

REFERRING to notes already published, a Dalry reader remarks: "I should have pointed out an error in the numbers given by Mr. Niven of Mr. J. Stirling's old 7 ft. 1 in. bogie engines. He gives Nos. 103 and 104, 113 and 114 as being of this class. This is incorrect. Nos. 103 and 104 were of the old 2-4-0 class, of which there were two lots, one with 6 ft. 6 in. driving wheels, the other with 6 ft. 0 in. driving wheels. Nos. 103 and 104 belonged to the latter type: I have a photo of No. 104 (now, of course, 104A). Nos. 113 and 114 were never numbers of the 7 ft. 1 in. bogie class. They are 0-4-2 engines of an old type, and are still running, rebuilt by Mr. Manson, but without domes. In your April issue, I might also point out some errors in Mr. Niven's notes. In what he calls the 'black goods' class the numbers were 12, 13, 17, 41, 43, 46, 47, 48, 49, 50, 51, and not as given by Mr. Niven. No. 16, which he gives as one of this class, is a much more modern engine belonging to Mr. Smellie's No. 5 class, but in turn again replaced last year by one of the large 2-6-0 goods. No. 159 does not belong to the 'black goods' class: it is a 0-4-2 engine, rebuilt by Mr. Manson in same way as 113 and 114 above mentioned. As to the 'Dromedary' class goods 6-coupled engines (160-179 inclusive), these are not of the same class as the No. 5 class. Mr. Manson's first goods engines were the 306-325 class, appearing late in 1892. These were the engines really designed by Mr. Smellie but turned out by Mr. Manson (Dubs, Glasgow, builders) and were practically the same as Mr. Smellie's standard goods engines, but with dome and Manson pattern chimney (though retaining the Smellie cab). The 'Dromedaries" did not come out until 1897-8 and were really Mr. Manson's first design of goods class, as designed by himself. In speaking of Mr. Smellie's 2-4-0 engines, Mr. Niven is again in error in the numbering of the 'celebrated twelve.' The numbers were: 18, 26, 27, 28, 29, 31, 40, 42, 157, 158, 185, 186—12 engines.

"Mr. Smellie's 6 ft. 0 in. 4-4-0 engines for the Greenock route were Nos. 119, 120, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 151, 152, 155, 156—24 engines.

"Mr. Smellie's 6 ft. 9½ in. 4-4-0 engines for main line traffic, Nos. 52, 53, 54, 55, 56, 57, 66, 67, 68, 69, 70, 79, 86, 87, 88, 89, 109, 153, 154—19 engines. You will see that Mr. Niven transposes some of the numbers of these two classes."

Some Corrections and Additions.

IN reply to the letter just quoted, and in view of remarks from other sources, Mr. Niven points out that No. 250 should be included among the Neilson 0-4-2 engines. Also that Mr. Smellie's Nos. 113 and 114 were 0-4-0 shunting tank engines. The engines referred to by a Dalry reader were rebuilt and renumbered, being originally of the old 187 Neilson 0-4-2 class built in 1870. No. 16, mentioned as a Stirling 0-6-0 'black goods' engine, should be among the Smellie series, though generally engaged in similar links with the Stirling engines. This engine was built at Kilmarnock in 1885. The list of "black goods" engines should therefore be Nos. 12, 13, 17, 41, 43, 46, 47, 48, 49, 50, 51, and 159, all built in 1877. No. 52 is a Smellie 4-4-0 engine, with 6 ft. 9 in. wheels, built at Kilmarnock in 1885. No. 159 does belong to the class mentioned, and it is suggested that a Dalry reader is probably confusing this with No. 259, a Stirling 0-4-2 engine of 1876. The "Dromedaries" were really Manson engines. They were built in 1898, for the Carlisle goods traffic, and numbered 160-9, with a further series in 1899 Nos. 172-179. A Dalry reader is quite correct in stating that the 306 class are Smellie engines, though finished by Mr. Manson.

Referring to the engines designated as "The Twelve Apostles," Mr. Niven gives these as Nos. 158, 185, 186 of 1879, and Nos. 18, 26, 27, 28, 29, 31, 40, 42 and 157 of 1880, all Smellie 2-4-0 engines with 6 ft. 9 in. coupled wheels and 18 in. by 26 in. cylinders. No. 30 was a Stirling 7 ft. engine.

Another Ayrshire reader, Mr. D. Smith, writes pointing out that No. 220 is a Smellie 0-6-0 goods; Nos. 16 and 45 are Smellie goods engines, not Stirling goods; No. 52 is a Smellie 6 ft. 9 in. 4-4-0; No. 84A a Smellie goods. He also states that the 160 class were designed by Mr. Manson. "Nos. 113-4 are 0-4-2's built by Sharp-Stewart and rebuilt by Mr. Manson. They have double cabs. In the list of Stirling bogies 20 are shown. Only 16 were rebuilt. Nos. 191-206, all being renumbered. Thus No. 39 became No. 205, 107 became 196, and 111 became 206. No. 18 was a Smellie 2-4-0. She has been stationed at Stranraer for over 20 years. In the list of Mr. Smellie's 6 ft. 9 in. 4-4-0's, 52, 55 and 65 should be included. No. 85 is a Manson bogie, Nos. 152-5-6 belong to Mr. Smellie's 'Greenock' engines, familiarly called the 'Wee bogies.' No. 65 was on the Kilmarnock to Ayr mail train in the Barassie disaster—4th February, 1898. She was replaced by a Manson bogie. The goods engine was No. 49, Stirling 0-6-0. She was replaced by No. 159 of the same batch whose number was taken by a 'Sharp-Stewart' similar to 113-4. Nos. 241-2, mentioned as having the bogie tenders from 77 and 78, were at one time hauling the 7.15 p.m. vacuum-fitted goods train from Glasgow to Carlisle (Durranhill) with one stop at New Cumnock for water."

All-Steel Cars.

A NATAL reader, Mr. Stephen G. Rich, writes anent a statement made in the March, 1916, issue of THE RAILWAY MAGAZINE, to the effect that the all-steel cars of the new electric service

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on the Manchester and Bury line of the Lancashire and Yorkshire Railway are probably the first cars in use anywhere that really are entitled to be called "all steel." Mr. Rich admits that the statement is in the main correct, seeing that for the most part the "all steel" cars in America and elsewhere have had more or less wood in their fittings. But he points out that cars that actually are *all* steel, without even the least bit of wood in them, have been in use in certain places in America for some little time. The following cases in America have come under his own observation:

(1) On the Long Island Railroad, on service between New York City and Far Rockaway, N.Y., all-steel cars without a bit of wood were in use in June, 1914, October, 1914, and later. This is an electrified line.

(2) On certain trains of the Pennsylvania Railroad, between New York City and Philadelphia, he rode in cars that were all steel, without any wood so far as he could see, in October, 1913.

(3) In April, 1915, on the Lehigh Valley Railroad, he rode in day-coaches that were all steel, without any wood whatsoever, in the neighbourhood of Ithaca, N.Y. In this case he noticed the cars particularly, and was himself somewhat surprised at the total absence of wood. In the first two cases Mr. Rich states that his memory of the cars being without any wood at all is not so clear and vivid as in the last case, but it is sufficient to make him quite sure of this statement.

Great Western Railway Locomotive "Fire King."

"As I distinctly recollect *Fire-King* at a later stage than that indicated by your correspondent in the May issue," writes Mr. W. E. Edwards, "I may supplement his remarks by saying that this locomotive was one of Gooch's original *Fire-Fly* class, and that she finished her career upon the Salisbury branch during the autumn of 1873, as a saddle-tank, although originally a 'single' express tender engine. *Fire-King*, as well as a sister engine, the *Sun*, was then driven by Engineman Thomas Harvey, of Bath, and invariably worked the afternoon passenger train arriving at Salisbury at 4.10. For that reason the train was locally known as 'Harvey's train.' The latter engineman, who, unfortunately, met his death while nearing Salisbury in August, 1873, owing to a collision with a goods train at that point, was said to have been the first driver to pass through the Box tunnel. The *Sun* was the oldest Great Western Railway engine the present writer recollects. She retained the Swindon brass plate bearing the date 1840. *Fire-King* was, practically, of the same age, and of the type (saving for driving wheel diameter) illustrated at page 347, vol. iii. of RAILWAY MAGAZINE. The 'hay-stacks,' however, had been replaced by the usual raised fire-boxes of the final broad-gauge era, fitted with a weather board of the pre-cab order. It may be noted that the latter fire-boxes were always termed 'domes' by the drivers of that day. Each of the locomotives in question retained the original horse-hair buffers, back and front, until the last. I may add that, when the Wilts and Somerset section of the Great Western Railway was opened in 1851 as far as Warminster station, before the construction of the remainder of the Salisbury branch, another former tender passenger engine, converted into a four-coupled saddle-tank, drew the first train in the public service from Westbury to Warminster. She was the *Sagittarius*, likewise illustrated in vol. iii., page 348."

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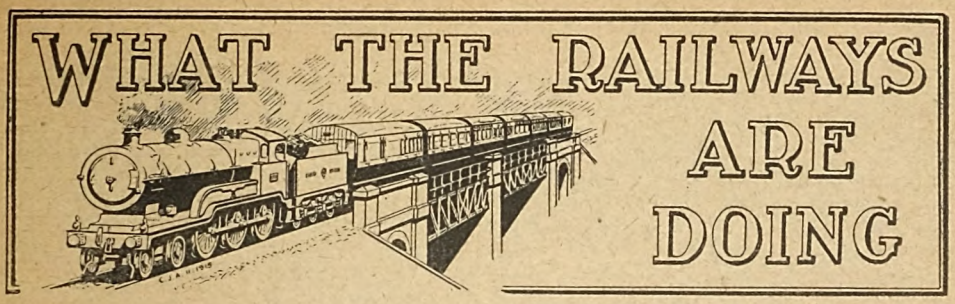

Electric working was inaugurated on the Manchester-Bury route, Lancashire and Yorkshire Railway, on Monday, April 17th. This work was fully described in the March Railway Magazine so that there is no need to refer in detail thereto but it may be mentioned that the service runs from Victoria Station, Manchester, through the residential suburbs of Heaton Park and Prestwich to Bury. Each five-car train provides for 389 passengers, 72 being first class. A comparison of the times occupied on the journey shows that the total run from Manchester to Radcliffe now occupies 20 instead of 26 minutes, and to Bury 24 min. instead of 32 min. (22 min. against 29 min. in the opposite direction), with corresponding gains at intermediate stations. Owing to the war the full service of electric trains is not being run, the trains virtually corresponding to the steam service except in regard to acceleration. Another advantage is the lessened cost of travelling. For instance, the daily cost of an annual season ticket is only 2¼d. first class and 1½d. third class to and from Victoria Station to Woodlands Road, whilst to Whitefield and back the cost is only 5d. first class and 3¼d. third class.

* * *

Sir Arthur Percival Heywood, Bart., died at his residence, Duffield Bank, Derby, on April 19th, at the age of 66. The deceased was an engineer of wide experience, and made valuable efforts to improve the position of agriculturists by the development of light railways on great estates. The first railway of its kind was erected by him in the grounds of Duffield Bank, and was designed for military as well as agricultural purposes. It is 15-in. gauge, and the maximum gradients are 1 in 25, the minimum curves half-a-chain radius. The rolling-stock comprises two locomotives, a bogie carriage, a number of open carriages, and merchandise wagons. These were all built on the spot, where workshops for the purpose were erected. This railway in miniature has as far as practicable been administered in much the same manner as are great railways, and traffic returns and reports used to be prepared periodically. Always a great object of interest, and unique in itself until its engineer erected another four miles long at Eaton Hall for the late Duke of Westminster. It was visited by people from all parts of the country and abroad.

* * *

The annual concert on behalf of the funds of the Irish branch of the Railway Benevolent Institution took place on April 15th, at the Rotunda Rink, Dublin, in the presence of a large audience. Previous to the concert, the annual dinner was held, Mr. E. A. Neale (General Manager, Great Southern and Western Railway) presiding. Amongst those present were a large number of the leading officers of Irish railways. Mr. M. F. Keogh, Chairman of the Irish branch of the Institution, and General Manager of the Midland Great Western Railway, responding to the toast of the Institution, stated that, despite war times, the revenue for 1915 was substantially more than in preceding years, and, with one exception, it was a record. The current year had been started satisfactorily, the receipts for the three months ending March 31st showing an increase over the corresponding period last year. It was only those in touch with railway workers who could appreciate the enormous benefits accruing from the Institution.

* * *

On the occasion of the promotion of Mr. R. C. Willis to the position of Registrar of the London and North Western Railway, an opportunity was taken by his old confrères in the Audit Department to show their appreciation of the high regard they had for him. A handsome cabinet of cutlery was presented to Mr. Willis, together with a gold bracelet for his wife, and Mr. F. G. Evans, the Chief of the Audit Department, who occupied the chair on the occasion, in his usual easy and fluent manner spoke of the highly deserved honour which had been conferred on Mr. Willis by the Directors of the Company. In addition to a large attendance of the Audit Office Staff, the Transfer Office was well represented.

* * *

At the advanced age of eighty-five Mr. T. G. Clayton, formerly Carriage and Wagon Superintendent of the Midland Railway, died recently at Bournemouth. In 1851 Mr. Clayton joined the Shrewsbury and Birmingham Railway in the locomotive department. This was the time when the London and North Western commenced a fierce competition with the above Company, with the view of obtaining possession of their line. They ran all passenger trains between Wellington and Shrewsbury—a distance of 11 miles—at 1d. fares, and also between Wolverhampton and Shrewsbury, *via* Stafford—a distance of 45 miles—for 6d. This struggle was continued for a considerable length of time. Mr. Clayton in 1853, became associated with the locomotive department of the London, Brighton and South Coast. He was afterwards attracted to the Great Western Railway, and in 1873

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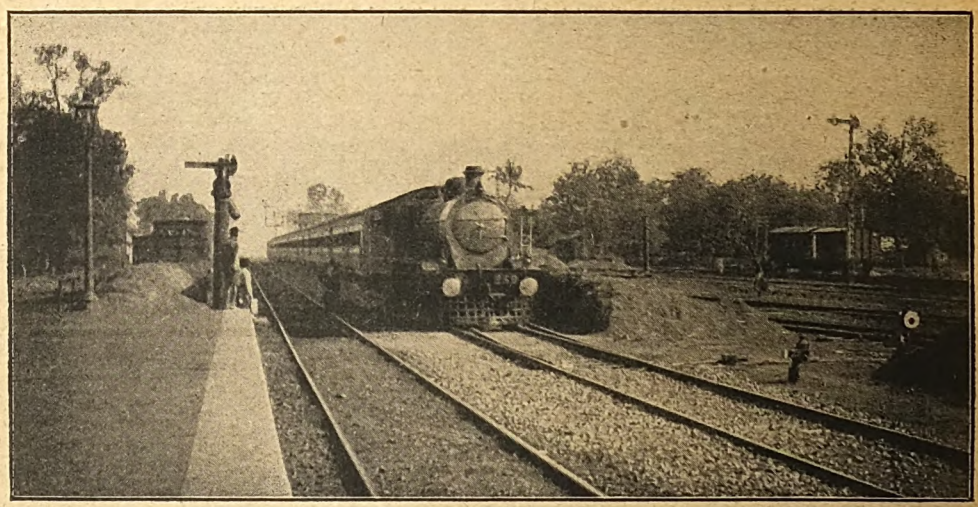
entered the service of the Midland Railway as carriage and wagon superintendent. One of his most important duties was to design the carriage and wagon works at Derby, which were built to his plans, and fitted up with all the most approved machinery and appliances which could be obtained at the time, now over forty years ago. The area of the works at Derby in 1873 was 8½ acres, in 1902 it was 126 acres (now 127), 34 of which were covered by shops.

* * *

THERE was an enthusiastic gathering at the Town Hall, Crewe, on the occasion of the presentation to Mr. and Mrs. Warneford of an illuminated address, a case of cutlery, and a diamond ring. The presentation had been arranged by the Railway Workers' Joint Committee, Crewe section, the Chairman of which is Mr. J. Smith, and the Secretary, Mr. W. Price. The illuminated address was the work of Mr. Fisher, a clerk in the time office. Mr. Fisher also executed the address which was presented to the King on the occasion of his visit to Crewe. Mr. J. Smith presided, and there were also on the platform, Mr. and Mrs. W. W. H. Warneford, Lieut. Warneford, Mr. and Mrs. E. C. Bickersteth, Mr. and Mrs. Winby, Mr. J. Homfray, Mr. E. P. Jones, Mrs. C. J. Bowen Cooke and Miss Cooke, Mr. and Mrs. H. B. Jones, Mr. W. Beaumont, Mr. F. C. Tipler, Dr. Wilson, etc. The illuminated address read as follows :—

"To Walter Wyndham Hayden Warneford, Esq.—We, the Crewe locomotive employés of the London and North Western Railway Company, desire, on your relinquishing the post of manager of these works to take up the position of superintendent at Earlestown, to demonstrate in a practical form the esteem in which you are held by all grades under your control. We trust this address will serve to convey our acknowledgment of the courteous and generous spirit displayed by you on all occasions when meeting our representatives, and to give expression to the good feeling always existing under your management. We take this opportunity of tendering our heartfelt wishes for your success in the higher sphere to which you have been called, and hope you may be spared in health and strength, and enjoy for many years to come the goodwill of the working men and the confidence of the Directors of the Company. Signed on behalf of the employés—JOHN SMITH (Chairman), WILLIAM BARRETT, CHARLES BATES, GEORGE WILKINSON, RANDAL JONES, WILLIAM PRICE (Secretary), JOHN WILLIAMS. March 20th, 1916."

* * *



Photo] [*J. N. Scotter.*

EASTERN BENGAL RAILWAY.

Down Darjeeling mail train entering Ranaghat Junction.
4-4-2 locomotive No. 259.

SINCE the transference by the Corporation of Edinburgh of the Cattle Market to the outskirts of the city, an increased traffic has had to be dealt with at Slateford Station (Caledonian Railway). Reconstruction of the station has therefore been sanctioned. The passenger platforms are to be lengthened to 600 ft., and to be increased in width. The present old-fashioned timber station buildings are to be taken down, and new platform buildings to be erected in their place. A new bridge of steel lattice girders will also be provided, together with new approach stairways.

* * *

THE Furness Railway annual wagon-coupling contest took place on April 21st. An open contest for twenty wagons was won by Guard W. Robinson, of Carnforth, who made the

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Alfred Aslett Cup his own property, and won also the Ramsden Cup. R. Wilkinson, Barrow, was second, and J. B. Armistead, Barrow, third. A fifteen-wagon contest for Furness guards was won by R. Wilkinson; second, B. Armistead; third, T. Threlfall, all Barrow men. The shunters and porters' contest, fifteen wagons, was won by R. Robinson, Carnforth; second, F. Wilkinson, Barrow, and third, F. Atkinson, Barrow.

* * *

At Manchester (Victoria) Station, Lancashire and Yorkshire Railway, two large-scale maps showing the various routes have been erected. They are in red on white tiles, and line the walls of the main entrance to the station.

* * *

Mr. Fred. E. Jacob, appointed Chairman of Directors, Rhondda and Swansea Bay Railway, in succession to the late Mr. George Deer, is the son of Colonel J. Jacob, of Aberavon, and brother of the Mayor of Aberavon. He is one of the proprietors of the Oakwood Colliery, Avon Valley, and was formerly manager of the Whitworth and Duffryn Rhondda Collieries.

* * *

Sir Charles Owens, late General Manager, London and South Western Railway, has been elected Chairman of the work of the City of London Territorial Force Association, and will hold the office till Colonel Lord Lucan returns permanently from the front.

* * *

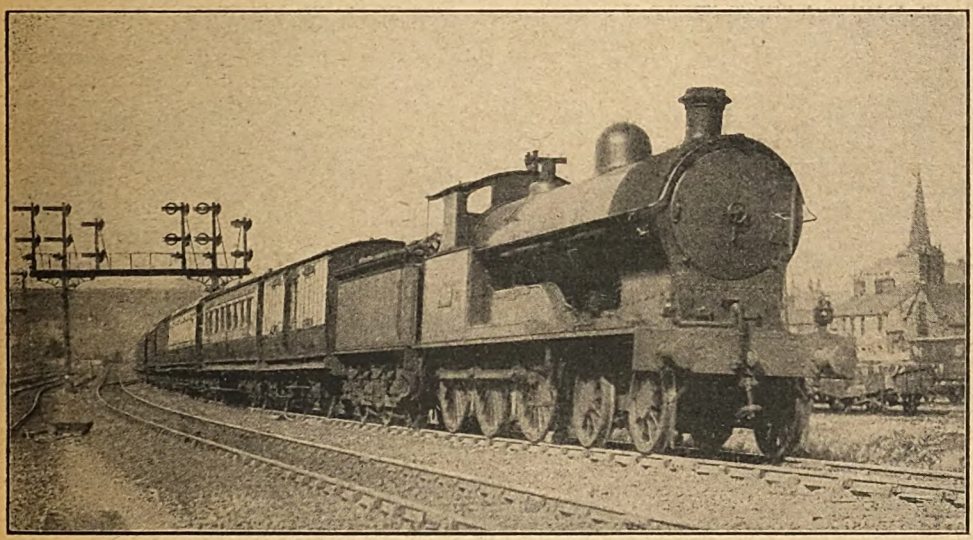
Mr. Thomas Richardson has been elected Chairman of the Belfast and County Down Railway, in place of the Rt. Hon. Thomas Andrews, resigned. Mr. Richardson has been a member of the Board for twenty-one years, having been appointed in 1895, the year in which Mr. Andrews undertook the Chairmanship. He is the head of the firm of Richardson and Craig, solicitors, and his residence is Springfield, Lisburn.

* * *

Commencing May 1st, 1916, the 1.50 p.m. Sheffield (Victoria) to King's Cross ceased to run, and the 1.40 p.m. King's Cross to York and Ripon ceased to call at Retford. The following trains were withdrawn as from April 25th: 10.48 a.m. New Holland to Immingham; 11.30 a.m. Immingham to New Holland.

* * *

A meeting of the Institution of Locomotive Engineers was held on April 29th at Caxton Hall, Westminster. In the unavoidable absence of the President, Mr. R. E. L. Maunsell, Chief Mechanical Engineer, South Eastern and Chatham Railway, the chair was taken by Mr. W. A. Lelean, Vice-President, supported by Mr. J. H. Burnett, Vice-President, late Locomotive Superintendent, Metropolitan Railway. A paper was read on the "Garratt Locomotive" by Mr. H. Woodgate-Dearberg. Mr. Dearberg's paper was illustrated by a series of drawings and photographs of Garratt locomotives already in use, together with examples of other articulated designs, and a drawing prepared by the author showing an outline of a suggested Garratt locomotive for main-line service on a British railway.



Photo] [*F. E. Mackay.*

LONDON AND NORTH WESTERN RAILWAY.
Glasgow-Euston express leaving Carlisle.
4-6-0 superheater engine *Sydney Smith.*

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Mr. F. Law, Wakefield, for the past eleven years Goods Superintendent for the Yorkshire district, Lancashire and Yorkshire Railway, has retired from official activities after having completed forty-eight years' service. He began his railway career in July, 1868, as a number-taker at Low Moor, and passed through various positions, eventually obtaining the high and responsible post he has just vacated.

* * *

Many and varied are the positions in His Majesty's Forces filled by railwaymen of all grades, but it is understood that Mr. E. J. Smyth, Paris Agent, London and South Western Railway, has the distinction of being the first English railwayman to obtain a commission in the Royal Flying Corps. He succeeded Mr. H. Bennett, who retired in 1914. During the absence of Mr. Smyth from Paris the office at 253, Rue St. Honoré will be in charge of Mr. C. C. Verrinder, who is known to most of our readers.

* * *

The Great Western Road Motor Department has now sent 41 per cent. of its total staff to the Colours, this being a departmental high-water mark for the railway. A large number of those who enlisted have joined the Mechanical Transport Branch of the A.S.C., where their many years' practical experience in road motor work has earned for them amongst their officers and comrades an enviable reputation for ability and thoroughness. Three of the supervisory engineering staff hold commissions in the Mechanical Transport, namely, Capt. H. T. Rendell, Lieut. B. Humphrey, and Lieut. G. Jones, while of the clerical staff, Lieut. R. G. A. Moody holds a commission in the 10th South Lancashires. Of the remaining 59 per cent. the majority are attested married men and youths. Notwithstanding the diminution of staff, the whole of the twenty-three regular passenger and mail road motor services are being operated with reduced runnings; also a considerable increase in the mileage and tonnage of the G.W.R. road motor vehicles engaged on goods and parcels traffic is being maintained, a good deal of Government stores and munitions being thus handled to and from the railway. The number and mileage of cartage motor cars at Paddington alone have increased 122 per cent. and 60 per cent. respectively, since July, 1914.

* * *

Three beds in the Allies' Hospital, Yvetot, near Rouen, have been maintained by the London and North Western Railway staff at Northampton since the middle of April, 1915. For this purpose over £150 has been paid to the Allies' Hospital Benevolent Society (registered for the administration of the Allies' Hospital, Yvetot) from the sums collected from the men of the various departments at Northampton.

* * *

Mr. H. Dunton, now District Controller for the London, Tilbury and Southend section of the Midland Railway, entered the service of the latter Company as junior clerk at Shefford on May 25th, 1887. He removed to Evesham in May, 1891, and to King's Norton as booking clerk in November of the same year. On June 19th, 1893, he was made booking clerk at Syston, and in July, 1895, was transferred to Leicester in a similar capacity. He became station-master's clerk at Leicester in September, 1895, and assistant inspector in February, 1902. In May, 1907, Mr. Dunton was promoted to the position of district traffic inspector at Trent. He was appointed district controller, Melton, on July 1st, 1911, and held this position until his present appointment.

* * *

Mr. Ingham Sutcliffe, M.I.M.E., Locomotive Superintendent, Londonderry and Lough Swilly Railway, has been appointed Assistant Locomotive, Carriage and Wagon Superintendent of the Canton-Kowloon Railway.

* * *

In the February Railway Magazine it was stated that the Reading shed number of the South Eastern and Chatham Railway also included Ash shed. A Bexhill reader mentions that Bexhill is included in Hastings shed number (12). At present there are two of Mr. Stirling's 0-4-4 tank engines with square cabs but no domes stationed there, Nos. 26 and 82.

* * *

Mr. R. W. Reid, the new Works Manager of the Midland Railway carriage and wagon department, Derby, is the son of Mr. W. P. Reid, Locomotive Superintendent, North British Railway.

* * *

A Cheshire reader mentions that recently he saw several of the large G.W.R. 2-8-0 goods engines painted in the new khaki livery. The numbers on the front buffer beam are painted an orange colour and show up particularly well. Some of the engines look rather well thus painted. For instance, 3137 a 2-6-2 T, which works coal trains to and from Birkenhead, looks quite smart in her new livery. He also noted a 0-6-0, No. 937, the engine painted khaki and the tender green. Some of the 0-6-0 saddle tanks are also being painted khaki. He also noticed a 2-4-0 tender engine thus painted. At Chester our correspondent saw a small 0-4-0 saddle tank, No. 95. It looked extremely old and ramshackle, and had not the appearance of Swindon birth. He asks whether any of our readers know anything of this engine.

* * *

"Travelling between Bath and Gloucester recently by the Midland express that leaves Bath for the North at 11.57 a.m.," writes a Bath correspondent, "I was struck by the fine running of the engine—No. 665, a 4-2-2—on the section between Mangotsfield and Gloucester, where the Great Western metals run parallel with the Midland track. Though the train was distinctly heavy, the quarter-miles were reeled

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off in brilliant fashion. One of these 'singles' always runs this train. The smooth running was another admirable feature. For work north of Gloucester, the Midland locomotive department evidently favour the 4-4-0 superheater non-compound type, with a 2-4-0 as pilot—an excellent combination when the Lickey incline has to be grappled with.

* * *

THERE was a very large gathering of London and North Western Railway officials and staff at Euston station, London, on May 12th, upon the retirement of Mr. F. H. Williams, after nearly 50 years' service in the Transfer Office. Mr. Williams's courteous manner to all with whom he came in contact, made him one of the most popular men at Euston. In his younger days an all-round sportsman, he later took the greatest interest in everything that made for the well-being of his confrères. The occasion was the presentation of a testimonial. Mr. R. Carrington Willis, in making the presentation, congratulated Mr. Williams upon having

"That which should
"Accompany old age, as honour, love,
"Obedience, troops of friends."

Mr. C. F. Grasemann, Mr. C. Chitty and Mr. A. L. Lloyd spoke in high terms of the esteem and regard generally felt for the recipient. We trust that Mr. Williams will have a long and happy retirement.

* * *

THE ambulance train which brought the first batch of wounded to the Bath War Hospital on Easter Monday travelled over the London and South Western and Somerset and Dorset Railways, and was hauled by one of the late Mr. D. Drummond's earlier 4-4-0 locomotives No. 299, and a Somerset and Dorset locomotive. It is believed to be over 30 years since a South Western engine was seen north of Templecombe prior to Easter Monday. In the early history of this railway, one or two of Mr. Beattie's 2-4-0 tender engines worked experimentally over this section.

* * *

OF the new series of 4-6-0 passenger engines ("Prince of Wales" class), referred to in the May number of THE RAILWAY MAGAZINE, the following have recently been completed at Crewe, Nos. 95 *Gallipoli*, 126 *Anzac*, 233 *Suvla Bay*, 849 *Arethusa*, 1100 *Lusitania*, 1324 *Falaba* and 2092 *Arabic*. Two of the Glasgow-built "Prince's" have recently had their stations altered—No. 1744 *Petrel* to Carlisle (29 shed) and 2175 *Loadstone* to Edge Hill (26 shed). No. 982 is the first of a new series of 0-8-0 mineral engines (Schmidt superheater) just completed at Crewe. No. 1416 is the only 4-6-2 tank non-superheater now running. Originally there were 12 such engines, all except the one referred to having been provided with superheaters. No. 885 *Vampire* (6 ft. "Jumbo") is the latest engine to be withdrawn from service. A new series of 4-cylinder passenger engines ("Claughton" class) is in course of construction at Crewe.

MANY years' close study of the railways of France and Switzerland has made Mr. E. J. Miller, secretary of the Railway Club, London, an authority of no mean merit. His paper, "Effects of the War on the Northern and Eastern Railways of France," ably delivered at the Club Library, 92, Victoria Street, S.W., on Tuesday evening, May 9th, was closely followed with keen appreciation by a goodly assembly of members. Mr. W. Parker presided and an animated discussion followed Mr. Miller's paper. Two Club outings have been arranged. First, on Saturday afternoon, June 17th, the Great Northern Railway line from Cuffley to Hertford, now under construction, will be visited, and on Saturday afternoon, July 22nd, there will be a walk from Potters Bar to Hatfield. Members intending to participate are requested to forward an early advice to the Secretary.

* * *

ON Friday, May 12th, the Press Bureau stated that "as the result of recent experience and special experiments, the Field-Marshal Commanding-in-Chief the Home Forces has issued, through the Railway Executive Committee, special instructions with regard to the working of lights which are to be normally maintained on railways, as well as to the further reduction of these lights, and the action to be taken by the railway companies on the occasion of raids by hostile aircraft. These instructions provide for the reduction of railway lights other than signal lights in districts threatened by hostile aircraft to the minimum necessary for the continuance of traffic, which in the national interest it is important to maintain under all conditions. Subject to the above necessity railway establishments and trains actually running will be rendered as inconspicuous as possible."

* * *

MR. JOHN LANE is publishing "Hearts and Faces," a novel by John Murray Gibbon, formerly editor of *Black and White*, and now General Manager of the Publicity Department of the Canadian Pacific Railway (crown 8vo, 6s.). Mr. Gibbon's book—the story of a young Scotsman who achieves fame in Art—deals largely with the studio life of London and Paris, a subject of which the author has extensive knowledge since he has himself studied Art in both cities and has, indeed, made of Art a life study.

* * *

IT is claimed that a new UndergrounD poster by Charles Sims, R.A., is the artist's first contribution towards the vigorous attempt which is being made to bring art and commerce into a fitting relation. The subject which Mr. Sims had to handle, the joy of a visit to the country round London for those worn out by the toil and stress of the City, gives plenty of scope to the artist for the exercise of that fanciful spirit, which is present in all that he does. He has chosen to make his lithograph a mere suggestive note rather than a finished piece of work. It is a glimpse of that Arcady which we all desire.

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Before the deep blue waters of a lake, fringed with trees, play the Little People whose work it is to deck the countryside with flowers, and by their freshness and gaiety to keep its spirit alive. It is their footprints which make the fairy rings in the fields. But Mr. Sims' "Little People" are neither elves nor goblins; rather they are of kin to the "Little Archer," children who never grow old. On the tree stump stands the classical figure of a shepherd, summoning the people of London into the country with the notes of his horn. On the left of the design is a sign characteristic of the UndergrounD. On this is the word "Arcady," and beneath it the legend "Alight here for Air, Sun, Winds, Flowers, Birds," while the nearness of Arcady to us all is emphasised by the words above the sign, "London—15¼ miles."

FROM the editor of *The South African Railways and Harbours Magazine* we have received a reprint in pamphlet form of articles on "The Speed of Trains on Narrow-gauge Railways," contributed to its pages by Mr. A. J. Beaton, M.Inst.C.E., Assistant Engineer-in-Chief to the South African Railways and Harbours. The author has made many valuable contributions to railway literature, and this is not the least important; a wide fund of information concerning narrow-gauge railways in all parts of the world being collected in connection with the subject dealt with. Several useful charts are included.

* * *

THE second underground railway in Buenos Ayres was inaugurated on February 15th, when the goods tunnel of the Buenos Ayres Western Railway, connecting their terminal station at Once with the Port of Buenos Ayres, was opened for service. The President of the Republic was prevented at the last moment from attending personally, but the Ministers of Public Works and Finance, the Mayor of the City, the Chief of Police and others, in addition to the local Directors and general manager of the Railway Company, made the inaugural trip in a special coach from Once to the port.

* * *

FOLLOWING preliminary oil fuel trials carried out on certain Indian railways, involving five systems of oil burning, with variations in the arrangement of burners, air supply, brick arches, fire-box linings, etc., the Holden system and the Mexican trough systems have been selected for final trials on new engines.

A RAILWAY STATIONERY COMMITTEE.

In connection with the necessary economies occasioned by the present shortage of paper, Sir Herbert Walker, General Manager, London and South Western Railway, has recently appointed a Committee consisting of representatives of various Departments for the purpose of revising and standardising the forms, books, etc., used in the railway's business. A number of meetings have already been held with beneficial results. The members of the Committee shown in the photograph reproduced above, reading from left to right, are Messrs. W. Robins (Engineer's), W. Capel (Stationery Stores), S. McLees (Goods Manager's), F. Bushrod (Traffic), H. Angell (Docks), R. Burch (Accountant's), G. Moreton (Loco.), L. Forsyth (Carriage and Wagon), F. V. Milton (Publicity), F. Pearce (Stationery), and the Chairman, Mr. W. Buckmaster (General Manager's).

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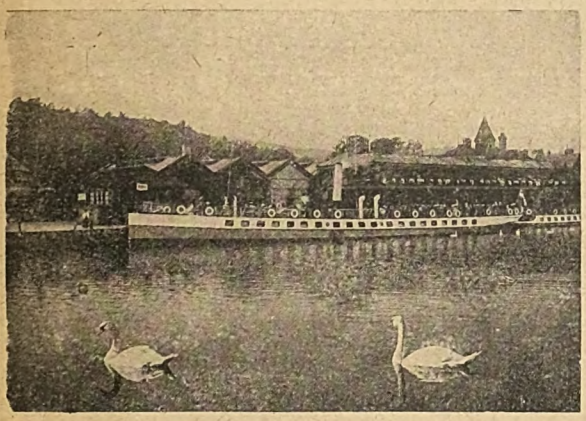

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